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Social Attention in Realistic Work Environments

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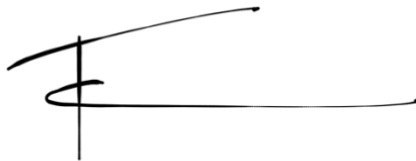
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I hereby declare that this PhD dissertation is my original work
and it has been written by me in its entirety.
I have duly acknowledged all the sources of information
which have been used in this dissertation.

This PhD dissertation has also not been submitted for any degree in any university previously.

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Theodore C. Masters-Waage

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In Loving and Living Memory of…

Anna Ruth Masters & Elizabeth Waage

The smartest people in a family of academics

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ABSTRACT

Social attention – the process by which individuals select which aspect of the social world to mentally process – is a key antecedent to all organisational behaviour in groups. This central role of attention has long been appreciated by organisational theorists, but our understanding of this core cognitive process has been hampered by a lack of empirical evidence. To create a method through which organisational scholars can study social attention, this dissertation combines cognitive science measures of attention with recent innovations from social and applied psychology using virtual reality to study naturalistic social behaviour (Chapter 1). This method is then applied to investigate the factors that determine whether individuals can capture the attention of their audience at work – e.g., charismatic job candidates receiving more attention than non-charismatic job candidates – and the downstream effects this has on individual-level outcomes (Chapter 2). These biases in social attention are then incorporated into models of group decision-making to demonstrate how micro-level attentional biases in group decision-making scenarios can translate into macro-level decision biases and thus sub-optimal decision outcomes (Chapter 3). The dissertation concludes with an inductive theory of "Socially Bounded Rationality" that hopes to spur future research on this topic.

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INTRODUCTION

Attention is the gateway between the external world around us and the internal world that our brains simulate (Parr & Friston, 2019). Our choice, whether conscious or unconscious, to select one of the millions of sources of information in our environment to pay attention to sets forth the network of neurological activation that results in organisational behaviour and more generally all behaviour (Capozzi & Ristic, 2018). It is this critical role of attention that helped form the foundation of the earliest behavioural theories of organisational behaviour (Cyert & March, 1963; March & Simon, 1958; Simon, 1947, 1957). However, as the years have progressed the central role of attention in organisational science has waned (Meißner & Oll, 2019; van Knippenberg et al., 2015). Across the top five journals in micro-organisational behaviour, only 27 papers have explicitly investigated the role of attention at work since the year 2000, with the majority of these adopting a macro-perspective (see Table 1). This dearth of empirical research has meant that we know little more about the role of attention in organisations than we did 50 years ago, despite frequent and recent calls for such research (Dane, 2018; Meißner & Oll, 2019; Ocasio, 2011; Reb et al., 2020; van Knippenberg et al., 2015). Using tools from cognitive science, concepts from social psychology, and the theoretical groundwork developed by the Behavioural Theory of the Firm (Cyert & March, 1963; March & Simon, 1958; Simon, 1947), this dissertation seeks to invigorate scholarly interest in the field of micro-organisational attention.

In particular, this dissertation focuses on the critical role of *social attention* within organisations. Organisations are complex social systems in which knowledge must be communicated across groups and individuals through social interactions (Gavetti et al., 2007). Social attention is the process that determines what subset of the available information individuals process during these social interactions at work. Therefore, understanding the micro-level nuances of the social attentional process, i.e., who/what employees pay attention to, is critical to understanding information processing within the firm.

Moreover, narrowing the theoretical microscope from the organisational (macro) to the individual (micro) level, social attention is also an important process by which employees can influence their organisations. All employees seek to influence others (Cialdini, 1987; Cialdini & Goldstein, 2004), whether

that be the boss to get a promotion, a recruiter to hire them for a position, or a group of subordinates to follow their instructions. If an employee cannot capture the attention of their audience their efforts to influence these individuals will be futile. Therefore, the social attention of others is valuable to employees' endeavours to succeed at work.

The importance of social attention on an organisational- and individual-level is what makes it a particularly fruitful topic of research for the organisational sciences. So, why has research on social attention not gained traction? The classic pitfalls of science operating in silos and not sharing advances across fields are partly at fault. However, the main factor holding back research in this domain is the lack of empirical tools to study this process. Organisational science places a high standard on the ecological validity and practical relevance of the research (Aguinis & Bradley, 2014; Meißner & Oll, 2019; Pierce & Aguinis, 1997). Therefore, the extremely abstract methods for examining attention used by cognitive scientists are largely undesirable to this field because they are typically over-simplified and use unrealistic stimuli (Johnston & Dark, 1986; Posner & Petersen, 1990). This has resulted in attention frequently being discussed by organisational scientists (van Knippenberg et al., 2015), used as a theoretical (hidden) variable (e.g., Barclay et al, 2017; Dane, 2018; Reb & Narayanan, 2014), measured as a self-reported variable (Brown & Ryan, 2003; Rothbard, 2001), but rarely empirically studied. In turn, this has stifled the progression of the theory surrounding the role of attention in organisations.

This dissertation seeks to address this by tackling three core questions:

1. *How do we measure social attention in realistic work environments?* (Chapter 1)
2. *Do certain social actors receive more (or less) social attention?* (Chapter 2)
3. *How does an inefficient allocation of attention to social actors, impact information processing and decision-making within organisations?* (Chapter 3)

These three questions seek to build on each other. The first is the methodological question at the heart of the lacklustre research on social attention in organisations. The second question then builds on this by examining what factors determine how much social attention one receives, focusing on the individual-level

role of attention. The third question then examines how the inefficient allocation of social attention impacts organisational decision processes, focusing on the organisation-level role of attention. Together these questions aim to provide a methodological and theoretical basis for organisational scientists to study social attention. These questions are addressed in three separate chapters, preceded by a broad literature review of social attention research in the cognitive and organisational sciences. The dissertation then concludes with an inductive theory development based on the insights from these chapters, seeking to understand how the nature of social interactions alters social information processing within organisations and ultimately decision making.

LITERATURE REVIEW

This literature review tackles social attention from two different angles. The first section, "From Cognitive Science to Social Attention", provides a brief overview of the study of attention in the cognitive sciences. Describing how individuals pay attention to the world around them to perform goal-directed behaviours. The second section, "From Social Attention to Organisation Science", integrates this cognitive view with the current perspectives on attention within organisations. Particular focus is given to how organisations, like brains, seek to structure attention in optimal ways and the inevitable challenges of this process.

From Cognitive Science to Social Attention

The human brain is the most complex system in the known universe (Ackerman, 1992). Despite its complexity it serves one simple purpose, to allow organisms to perform goal-directed actions (Wolpert & Landy, 2012). To do so, the brain must sample information from the surrounding environment, retrieve past information stored in memories (e.g., goals, beliefs), and integrate this information to produce behaviours (Oppenheimer & Kelso, 2015b). This process takes place in working memory, which is a short-term *limited* store of memory in which individuals can manipulate and integrate information (Baddeley, 1992; see Figure 1). Working memory is what allows for the majority of functions associated with human behaviour such as language, mental arithmetic, future planning, and so on, with researchers suggesting that humans' superior working memory capacity is what provides our species with a cognitive advantage over the rest of the animal kingdom (Herculano-Houzel, 2012). However, despite its superiority relative to other animals, human working memory is significantly limited with individuals only able to process between 3 to 4 distinct pieces of information at any given moment (Cowan, 2010a, 2010b). This means the human brain must decide which pieces of information, from the near infinite amount of sensory input and stored information in memory, to cognitively process in any given moment. This selection process is the role of attention.

Attention is defined as the behaviour (conscious/intentional or unconscious/unintentional) that determines what subset of the available information (sensory or stored in memory) is being processed by the

brain in any given moment (Cohen et al., 2012; Desimone & Duncan, 1995; Pitts et al., 2018). Note, this definition is aligned with what cognitive neuroscientists term "selective attention" (Posner & Rothbart, 2007), and what some management (strategic) scientists term "attentional selection" (Ocasio, 2011). Attention requires executive control, meaning it requires individuals to inhibit certain information in the environment and actively seek other information (Miller & Cohen, 2001). Specifically, individuals direct their attention toward information that is relevant to an incomplete goal (Mason et al., 2007, 2010). However, a challenge that every reader has no doubt encountered is that at any moment we have a variety of unfulfilled goals. For example, given that you are reading this dissertation you likely have the unfulfilled goal to finish this dissertation (or at least this literature review), however, it is inevitable that at points your attention will drift to other unfulfilled goals such as deciding what to eat for your next meal, or to respond to an email. This process of attention switching between unfulfilled goals is typically called mindwandering or daydreaming (Mason et al., 2007; Smallwood & Schooler, 2015), further, research has also shown that individuals remember information related to incomplete goals, termed the Zeigarnik effect (Zeigarnik, 1938). Ultimately, the function of this goal-directed attention is to facilitate future goal-directed actions and their related rewards.

Human goals are related to a variety of different outcomes from personal, to professional, to evolutionary. In the applied behavioural sciences, we typically focus on conscious goals that individuals actively maintain and pursue, e.g., work goals or status goals. These goals, often referred to as top-down attentional control (Buschman & Miller, 2007), are what allow exam students to consciously direct attention back to their work even if there is something more interesting happening out of the window. However, over time this originally conscious goal-driven attention can become automatic. For example, children crossing the road in the US who were told to look left to avoid being hit by a car (a survival goal), develop into adults who automatically look left when approaching a road and make awkward mistakes when travelling to England on holiday. Research has also found that due to its importance in modern society, individuals fixate attention more on images of money relative to other pieces of paper (Anderson et al., 2011). A final form of goal-

directed attention is based on evolutionary goals. Research has found that individuals pay more attention to losses than gains (Lejarraga et al., 2019), bright coloured than dull-coloured objects (Turatto & Galfano, 2000), snakes than sticks (Soares et al., 2017), and attractive potential mates than unattractive potential mates (Valuch et al., 2015), each of which can be linked to evolutionary goals related to survival and reproduction. In sum, irrespective of whether goals are conscious, automatic (i.e., learned over time), or evolutionary, an individual's attention system is geared to prioritize goal-relevant information over non-goal-relevant information to facilitate future goal-directed actions.

Pursuing goals is the primary function of attention and the brain, however, individuals also live in a dynamic environment in which new threats or potential sources of rewards could arise. Therefore, in the pursuit of its goals, the human brain must also update its map of the local environment. To use an analogy from the management literature, if the goal-directed attentional control described above could be considered as *exploitation* of one's cognitive resources, the continual monitoring of the environment around can be considered *exploration* for new threats and rewards (March, 1991). To track the local environment, individuals build mental maps of the world (Von Helmholtz, 1867). Neuroscientific research has found that the regions of the brain responsible for sensory processing are arranged in a map like structures with specific neurons responsible for responding to specific areas in the environment (Feldman & Brecht, 2005). Further, research on social cognition has found that these maps also extend to abstract settings as individuals have maps of social networks and decision environments (Fiske & Taylor, 2013). By maintaining these maps and storing these maps in memory, individuals can then compare new information from their environment with their existing mental model (Parr & Friston, 2019). However, instead of creating a detailed map of the-world-around, the brain instead relies heavily on stored memories (i.e., prior beliefs) and only occasionally directs attention to the-world-around to check (or hypothesis test) that the world was as they expected it to be (Friston, 2012; Sanborn & Chater, 2016).

This frugal attention to the outside world allows individuals to direct more of their limited attention to 'exploiting' their current goals. However, attentional resources quickly shift to the external world when

individuals notice something unexpected, i.e., information not consistent with the mental model stored in memory. This pop-out effect, often termed bottom-up attention (Buschman & Miller, 2007), has been extensively studied in cognitive science. For example, newborns show attention biases toward novel unexpected information (Fantz, 1964), we all experience a peak in attention when a magician can produce an unexpected rabbit out of a hat, and in a field of white poppies, our attention would naturally be drawn to a single red poppy. Research in cognitive neuroscience attributes this cognitive process to the functions of the anterior cingulate cortex (ACC) which among other functions monitors conflict states (Botvinick et al., 1999). By monitoring *conflict*, in this case between an individual's mental model of the environment with the present sensory input, the human brain can efficiently direct attention to the non-goal-relevant information in the environment only when it will be meaningful to process, otherwise, we can continue pursuing goals in blissful ignorance.

The interplay between goal-directed attention and monitoring of the external environment is highlighted by examples of when these systems fail. An example of this is the invisible gorilla experiment (Simons & Chabris, 1999). In this experiment participants are asked to watch two teams of individuals in different coloured shirts each pass around a ball, the participants are given the goal to count how many passes the team (wearing red shirts) make. This task requires a lot of executive control as individuals need to constantly track the ball and ignore the ball the team in blue shirts is passing around. Using goal-directed attention, participants typically do very well at this test. However, participants also do not notice when a person in a gorilla suit comes into the middle of the screen and beats their chest. To many people, this phenomenon (termed inattentional blindness) seems absurd because a person in a gorilla suit *should* pop out of any visual scene, you could also argue individuals fail to monitor their environment and spot an unexpected 'dangerous' gorilla. However, this problem arises because participants' attention is fully focused on the ball being passed and therefore their brain (erroneously) assumes the rest of the environment stays the same, and they assume that there will be no gorilla. Inattentional blindness demonstrates both the remarkable ability of the brain to focus attention resources on goal-directed information and also how this

reduces the availability of resources for monitoring the environment. However, importantly, experimenters

can increase the likelihood that participants will notice the gorilla by priming them with a 'detection goal', i.e.

instructing them to be on the lookout for unexpected information (Légal et al., 2017). Further, the famous

'cocktail phenomenon', that even when having a conversation at a busy party we still notice if someone calls

out our name, demonstrates that when goal-related tasks are not too engaging/absorbing (e.g., having a

conversation) individuals can still monitor the environment for unexpected information. In sum, inattentional

blindness demonstrates that there is a balance between goal-focused attention and monitoring of the

environment that can become too biased toward one side.

A second psychological phenomenon that further reveals the role of attention comes from patients who

suffer from hemispatial neglect. Hemi-spatial neglect is caused by brain damage to the temporal parietal

junction and results in individuals being unable to shift attention to the contralateral field of vision (Parton et

al., 2004): i.e., if they have damage to the right hemisphere, they cannot shift vision to objects in their left

visual field. These individuals still have goals to accomplish and besides their incapacity to shift attention to

one field of vision have a fully functioning cognitive system. Therefore, the challenges faced by these

individuals highlight the critical role of attention. Figure 2 shows some classic consequences of this damage.

The images show individuals with different goals (shaving/drawing) only shaving half their beard, drawing

numbers on only one half of the clock, or drawing only half a house from memory. These 'failures' to

accomplish their goals are the result of their inability to shift their goal-directed attention to (for example)

the left side of an image to finish a drawing. However, even more strikingly, these individuals also can only

update their model of the world in the right field of vision. Therefore, when individuals 'check' to see if their

goal was completed the information they receive (i.e., a drawing of the right side of an image) informs them

that they have finished the drawing. As a result, individuals with hemispatial neglect are unaware that they

are only completing 'half' of their goal. These profound errors highlight the critical interplay between goal-

directed attention and the updating of one's model of the world around. Individuals will direct attention

toward their goals until they get bottom-up feedback that their goal has been complete, in which they will then direct attention to other incomplete goals. `

The goal-directed attention process and the updating of an individual's map of the environment both results in meaningful and measurable patterns of attention in which certain actions/objects/individuals/etc. (e.g., aggressively spoken words, money, spiders, attractive people, novel objects) attract systematically more attention. These patterns of attention are typically referred to as attention biases (e.g., Barry et al., 2015; Ma et al., 2015). Similar to goals, these biases can be temporarily related to a specific goal (e.g., focusing on an exam), they can be learned over time and become automatic (e.g., looking left for traffic), and they can be there as a result of evolutionary bias (e.g., attention bias to faces). Similarly, we can view the increased attention devoted to surprising events in the environment as a novelty bias (Fantz, 1964). Note, the term bias is purely mechanistic and does not infer that those processes are an error. Thus, at points in this dissertation, when referring to specific patterns of attention, they will be referred to as *attention biases* (e.g., a gender attention bias; Chapter 3). Nevertheless, it is important to note that the source of these biases is goal-directed attention.

The attention process described above has primarily been studied in psychological laboratories, however, this same process applies to social environments. Individuals have social goals and just like individuals build a map of the visual world, they also construct a map of the social world. These maps include prior expectations, for example, norms for behaviour in specific situations, that if violated will attract attention (Fiske & Taylor, 2013). However, the social world is unique in that unlike the visual world which does stay relatively stable over time, the social world is constantly changing with different forms of information coming and going with each passing moment. Therefore, the importance of goal-directed attention and updating the social environment is even more critical. The critical role of social attention is highlighted by cases in which this attention system is impaired. Individuals with autistic spectrum disorder (ASD) have been shown to pay less attention to social information during interactions with others: e.g., less attention to faces (Katarzyna & Fred, 2010) and less responsiveness to the gaze direction of others (Nummenmaa & Calder, 2009). These

differences can have severe downstream effects on individuals with ASD's capacity to function in social environments (Dawson et al., 2004). This can be attributed to their inability to pursue social goals and construct an effective map of the social world around them and update this in light of new information (Adolphs et al., 2001). As a counterexample imagine you just got a new job and had to go for a meeting with your new work team for the first time, it is inevitable that you would be in a heightened state of attention noticing how each of the team members speaks, how they speak to one another, their body language, and so on. This is because you would be in a new social environment and have a goal to understand those around you to determine if they are warm, competent, etcetera. However, if you fast forward one year and you are now sitting in a meeting with the same team you have worked with for a year your attentional system does not need to work as hard because 'you already know' (i.e., make assumptions about) how each team member will react. In sum, the same attention processes that are studied by cognitive scientists involving low-level cognitions also map onto higher-level social cognitive processes: see Chapter 1 for a deeper discussion of social attention.

This dissertation examines the role of these social attentional processes in naturalistic organisational settings. Organisations are some of the most complex social environments in society in which individuals typically have conflicting goals. They are also dynamically updating with new information constantly, requiring employees and teams to update the mental maps of their organisational environment to pursue their goals. The cognitive constraints on the brain mean that executive control can focus attention on a very limited amount of information at any given time and thus understanding what information employees choose from the vast array of available information is tantamount to understanding organisational behaviour in all work contexts (Ocasio, 2011). This next section considers how attention has been studied within organisations to date, and the role of social attention in macro-level organisational processes.

From Social Attention to Organisation Science

Cognitive science and specifically attention research have played a formative role in the study of organisations outside of economics (Cyert & March, 1963; March & Simon, 1958; Simon, 1947). Herbert

Simon's (1957) thesis that employees are only boundedly rational and thus inevitably prone to violate the assumptions of expected utility theory, opened the door to psychological explanations of organisational behaviour (Cyert & March, 1963; March & Simon, 1958). However, whilst this field of study has boomed, research on the role of attention in organisations has been sparse (Meißner & Oll, 2019; Ocasio, 2011), which is particularly surprising given that the fundamental basis of bounded rationality is that an individual's attentional capacity is limited (Simon, 1957). The existing research can be separated into two broad groups. The first is the micro-research on employee attentional resources which is a relatively small body of literature. The second is the macro-research on the behavioural theory of the firm which despite being developed over 50 years ago still provides some of the clearest articulations of the organisational role of attention. This latter stream has also provided significantly more empirical research on the role of attention at the organisational level (Argote & Greve, 2007; Gavetti et al., 2007, 2012). These two groups of research are reviewed separately below with more focus given to the latter stream.

Micro-Level Research on Attention

Organisational research on attention has made significant advances in understanding the importance of attention as an antecedent to employee performance. Broadly speaking, this research has demonstrated that an individual's capacity to be more attentionally engaged at work, i.e., less distracted or mindless, is positively related to performance (Dane, 2011; Rich et al., 2010; Rothbard & Patil, 2011). Further, research has found that specific work events such as interruptions or work-family conflict can decrease the extent to which individuals can be attentionally engaged at work (Leroy, 2009; Leroy & Glomb, 2018; Leroy & Schmidt, 2016; Rothbard, 2001). Related research on mindfulness, which is defined as present-centred attention, has demonstrated the benefits of this practice on well-being (Brown & Ryan, 2003), interpersonal relationships and cooperation (Masters-Waage et al., 2021), along with a myriad of other benefits (see Creswell, 2017; Good et al., 2016).

There are several theories in micro-organisational behaviour that have sought to describe this critical role of attention at work. First, Kanfer & Ackerman (1989) proposed and researched the resource allocation

model which holds the central tenet that cognitive resources are limited and thus employees' task performance can be understood as a function of their: i) individual difference in attention resource capacity, ii) attentional demands of the task, and iii) capacity to regulate attention. Second, a research paradigm developed by Rothbard (2001) focused on the importance of attentional engagement as a key element of work engagement. Investigating how specific factors (e.g., family life) can drain employees' attentional resources and thus impact job performance and attitudes. A third similar theoretical model developed by Beal et al. (2005) integrated the role of attention with affect, arguing that the self-regulation of attention allows individuals to balance the attentional pull off a work task with the attentional pull of a non-work task.

These three research streams have similar underpinnings and focus. Specifically, they view attention as a critical resource for employees that can be expended, and they focus on how this facilitates job performance. Interestingly, this research is notably non-cognitive, meaning that it does not study the process by which individuals sample information from the environment, integrate that with other information, and respond (Atkinson & Shiffrin, 1968; Oppenheimer & Kelso, 2015a). A notable exception to this is research on attention residue (Leroy, 2009) and theoretical research on the role of motivated cognition (Barclay et al., 2017). As a result, the method used in the extant literature on attention has focused on the use of psychometric techniques to estimate individuals' perceptions of attentional engagement at work (e.g., Rothbard, 2001) or related measures of general attentiveness (e.g., Kanfer et al., 1994). This is notably distinct from the methods used in cognitive psychology to measure attention processes (Allport, 1989; Leroy, 2009; Mason et al., 2010), see Chapter 1 for further description.

This methodological divergence underlines the theoretical contrast between the current dissertation and past micro-level work on attention in organisations. The first obvious distinction is that this thesis examines social attention whereas past work has focused on attention toward work tasks more generally. The second distinction is that the existing work focuses on attention as a resource (a resource perspective), however, as evident from the previous section, this thesis views attention as a selective goal-directed behaviour (a behaviour-perspective). This is a fundamental distinction that warrants further discussion.

Whether attention is viewed as a resource or a behaviour, partly depends on how an event is specified in time. If a researcher is interested in how attention is allocated over a period of time, e.g., a meeting, then one could conceive of it as a "resource": an employee cannot pay attention to everything, so they allocate attention to different sources to achieve their specified goals. However, at any specific moment we can feasibly pay attention to one source of information (Treisman, 1969), and from that source, at most, a few pieces of information (Cowan, 2010b). Therefore, in each moment there is a selection (i.e., behaviour) of what to be attended to. This dissertation adopts this moment-to-moment perspective of attention; for further discussion see Chapter 1. In sum, the contrast between the resource-perspective and the behaviour-perspective of attention is in part due to the difference in the conceptualization of time, a resource-perspective can describe how attention is allocated *over a period of time*, whereas a behaviour-perspective can describe where attention is at *any specific moment in time*.

Another major distinction with the behaviour perspective is that the resource perspective views attention as a 'limited resource'. In other words, there is a pool of attentional energy in the brain that can be used up (Rothbard, 2001). From the previous section on the cognitive underpinnings of attention, it is clear that there is no single "pool" of attention in the brain, instead, attention is a distributed process accomplished by the whole brain (Parr & Friston, 2019; Posner & Petersen, 1990). Further, whilst there have previously been psychological theories that argue cognitive resources draw from a specific pool (e.g., ego depletion), these theories have failed direct replication on numerous occasions (Dang et al., 2021; Hagger et al., 2016), questioning the existence of these social resources. That is not to say that there are no limits on cognition, most notably there is working memory which is a limited store of information that individuals can maintain at any given point. However, critically, working memory is a downstream cognitive process following attention (see figure 1). Further, there are also biological limitations on the brain such as the availability of glucose (energy) and neurotransmitters (signalling molecules between neurons; Friston, 2009; Webster, 2001). In sum, there is no evidence that individuals have a limited resource of *attention*. To demonstrate this, consider the following example: After writing a tough email individuals may feel the need

for a break to "refuel" their attention, something they might do in this break is scroll through social media. However, scrolling through social media requires a vast amount of attention processing, so it is hard to believe that someone with 'no attention resources left' could accomplish this and even more unlikely that they could feel refreshed and ready to pay attention to work again afterwards.

Nevertheless, whilst there is not a biological limit to our attention, there is a subjective experience of being attentionally drained. This experience of being unable to focus is potentially a combination of different processes, including a lack of motivation to continue a task resulting from competing goals (Friese et al., 2019; Inzlicht & Schmeichel, 2012). This subjective feeling of being drained is, in itself, an important variable to be studied and understood. Past research in organisations has also extensively studied factors that might lead individuals to feel disengaged or drained at work (e.g., Rothbard, 2001). However, the scope of this dissertation focuses on the cognitive side of attention by examining the selective and goal-directed nature of attention.

To conclude, considerable organisational research has identified the critical role of attentional engagement as an antecedent to organisational performance. Deepening our understanding of the role of attention in organisations, the current thesis focuses on the role of attention as a selective behaviour which has received considerably less empirical study (c.f., Overbeck & Park, 2006; Shim et al., 2021) and theoretical scholarship (c.f., Barclay et al., 2017). Further, this thesis grounds the study of attention in the social domain, which is not just novel for the organisational literature but is also a scarcely studied topic in the brain and behavioural sciences (Dawson & Foulsham, 2021).

Behavioural Theory of the Firm.

The Behavioural Theory of the Firm (Cyert & March, 1963; March & Simon, 1958; Simon, 1947) is a psychological-based view of the firm. As a meta-theory, its primary contribution is in developing methods for thinking about and empirically testing firm behaviour that is grounded in the psychological - and particularly cognitive - science (Argote & Greve, 2007). According to this theory, organisations are "groups of individuals that need to coordinate knowledge within the group to make decisions" (Gavetti et al., 2007). Decision

making is thus the primary operation of an organisation, and the behavioural theory thus seeks to understand this process (Simon, 1979). In doing so, the behavioural theory, and its academic offshoots (e.g. attentional theory of the firm; Ocasio, 1997), focus heavily on the role of attention in determining the operations of the firm. This section reviews this literature and indicates how an updated view of attention can further advance this field.

One of the core assumptions of the behavioural theory is that individuals are boundedly rational (Simon, 1957). Bounded rationality refers to the "limited or imperfect cognitive representations that actors use to form mental models of their environment" (Gavetti et al., 2007). Recalling the previous section, bounded rationality is a concept based on decades of research in cognitive science demonstrating that individuals can only feasibly process a small amount of the information available and thus, to be efficient, construct imperfect maps of their environment in the pursuit of goals (Friston, 2012; Posner & Petersen, 1990). The reason that the idea of bounded rationality eluded economists for so long is likely because the imperfect map of the world our brain predicts is so subjectively vivid and believable (Blackmore et al., 1995; Kahneman, 2011). However, the imperfections of our mental model/map of the world are exposed when it comes to complex higher-order cognitions such as decision making.

The most immediate consequence of bounded rationality is that individuals violate the assumptions of rationality prescribed by classical (and neo-classical) economics, and instead of seeking to optimize outcomes, individuals instead search for outcomes that are satisfactory and sufficient: i.e., satisficing (Simon, 1955). The heuristics and biases program of research (Tversky & Kahneman, 1974), which was heavily influenced by work on bounded rationality, has identified numerous examples of when decision making can become 'irrational' as a result of an individual's bounded cognitive capacity. Given that the behavioural theory views decision making as the process by which firms should be evaluated it thus follows that the volatility/uncertainty of the organisational world and the limited ability of attention to map this world accurately, results in individual's inherent "bounded rationality" and the related "pathologies of organisational behaviour" (Gavetti et al., 2007).

A primary challenge associated with bounded rationality in organisations concerns information search. Organisations are structures of knowledge/information (Cyert & March, 1963). This information is distributed amongst different groups/individuals and flows amongst these groups depending on how the individuals (social actors) within an organisation attend to each subunit (March & Simon, 1958). Therefore, successful organisations require those decision makers have access to (i.e., pay attention to) the information necessary to make the most optimal decision (Ocasio, 1997). However, as a result of bounded rationality, an individual's search process is non-optimal. Specifically, individuals search for information based on an imperfect mental map of their organisational environment (Simon, 1955, 1956). Further, this mental map can differ across individuals and teams depending on their beliefs and past experiences. To manage the challenge of imperfect search, similar to how the visual attention system develops attention biases based on individual goals, the information search process becomes heuristic based on organisational goals (Gigerenzer et al., 2011; Shah & Oppenheimer, 2008). In other words, search follows specific relatively rigid processes determined by goals (current or chronic/top-down or bottom-up), that reduce the demands on the attentional system and can become adaptive (or maladaptive) within certain well-defined decision environments.

Organisations play an important role in directing individuals' attention to organisationally relevant goals. According to the behavioural theory, organisations provide structure to how individuals pay attention (and subsequently devote time and energy) to possible issues within an organisation (Cyert & March, 1963; Ocasio, 1997). Specifically, the organisational hierarchy and specific managers act as "attention-directors" that channel attention toward certain issues (Gavetti et al., 2007), by channelling attention to these issues this sets off a cognitive process within each individual, allowing for deeper consideration and ultimately goal-directed action (Wolpert, 2011). For example, leaders play a critical role in defining goals for their followers and thus directing the attention of their organisation to critical issues (Ocasio, 1997). The channelling of attention within organisations can become formalized over time into set routines, e.g., pay attention to the leader. These routines act similarly to individual-level goal-directed attention but operate on a macro

(structural) level (Cyert & March, 1963). The successful navigation of attention within organisations can help reduce conflict between subunits' goals and facilitate the mass cooperation required by organisations. Ultimately, directing attention to organisational goal-relevant information serves to improve decision making within an individual's inherently imperfect cognitive system (Cyert & March, 1963).

Whilst organisational structures serve to allocate attention to more (organisational) goal-relevant information, the resultant decision-making process is still far from optimal. Even with guidance, individuals can still only feasibly pay attention to a small fraction of the information in their decision environment (Ocasio, 1997). Further, the strain on the attentional system is even greater in social interactions in which the decision environment is extremely dynamic with novel information coming in each passing moment and only being available for short periods of time; for a further discussion see Chapter 1. The behavioural theory of the firm considers how the complexity of the social environment affects decision making, arriving at the "Garbage Can Model" (Cohen et al., 1972), which proposes that a quasi-random combination of problems, solutions, and decision makers, are all present when making social decisions, meaning that information search is (even more) challenging for individuals and thus their mental map of the decision environment is (even more) imperfect. This "organisational anarchy" (Cohen et al., 1972) underlines that even within the structure of an organisation the challenges of decision making, as a result of bounded rationality, are so substantial that they warrant further scholarly attention and practical solutions.

To help unravel the complexity of this 'garbage can' process this dissertation examines the critical role social attention plays in organisational decision making. The majority of major decisions within organisations are made by groups or teams (i.e., social decision making). Therefore, the decision environments that individuals operate in are often social environments with information distributed amongst different social/organisational actors (Argote & Greve, 2007). Whilst research on decision making has considered the role of attention (Orquin & Mueller Loose, 2013), very little work has considered the role of social attention in decision making (Rilling & Sanfey, 2011). Further, extant research on attention within organisations has focused on how organisational-level attention affects macro-level firm behaviour. For

example, research has examined how structures within the organisation, such as initiatives and decision making channels, operate to guide firms' attention toward organisational issues (Ocasio & Joseph, 2005). Research has looked at the role top management teams and executives' attentional orientation plays in determining firm behaviour (Cho & Hambrick, 2006; Eklund & Mannor, 2021). The nature of firms' issues, whether they are related to performance or power, has been shown to determine the level of attention information related to that issue receives (Tuggle et al., 2010). This research has helped develop the field's macro-level understanding of how attention, time, and effort are allocated within organisations. In doing so this research follows the path set out by the behavioural theory of the firm (Cyert & March, 1963), however, it gives less attention to the cognitive science approach championed by Herbert Simon (1947) which focuses more heavily on micro-level attention processes occurring on the individual level. Therefore, this dissertation aims to reorient focus back to this micro-attentional process whilst also keeping the focus rooted in organisational science as prescribed by Herbert Simon (p 507-508, 1979) by examining the "social-psychological factors that enter into the decision process in organisations".

Conclusion

The sections above have reviewed research on attention starting with the role of attention in the brain and ending with the role of attention in complex organisations. There is a beautiful synergy between these two processes. Both organisations and human brains pursue their goals based on imperfect maps of a complex environment (Cyert & March, 1963; Von Helmholtz, 1867). Attention allows both organisations and brains to sample information from their current environment to pursue their goals. However, attention is inherently limited, meaning that only a subset of the available information can be attended to at any given moment. To manage this, brains and organisations set up systems to structure attention toward goal-relevant information, in organisations these are routines and in the human brain, this is through top-down attention control. It is also notable (and beautiful) how the processes through which attention is structured in organisations, i.e., setting up systematic structures to guide attention, is similar to the processes that operate within the brain discussed in the previous section, i.e., attentional biases based on conscious, learned, or

evolutionary goals. Nevertheless, these attentional structures are partial solutions to cognitive limits that

attention operates under and further due to their systematic nature they open the possibility to systematic

errors. The next three chapters focus on how social attentional processes can be measured (Chapter 1), the

systematic variation in this system (Chapter 2), and the implications of inefficient attention allocation on

organisational decision making (Chapter 3).

CHAPTER 1

THE MEASUREMENT OF SOCIAL ATTENTION

There are three major challenges to measuring social attention. This chapter seeks to address each of these challenges by developing a new paradigm for organisational research. This will then serve as the methodological backbone for the following chapters exploring the theoretical nuances of social attention.

The first challenge is theoretically specifying *what* social attention is. The preceding literature review provided an updated view of the role of attention as a selective behaviour of the brain to pursue one's goals and pointed out how this differed from the "resource view" typically focused on by micro-organisational psychologists (Kanfer & Ackerman, 1989; Rothbard, 2001). By viewing attention as an objective behaviour of the brain, a precise theoretical model of this variable can be constructed. This model is specified in the section "What is Social Attention".

The second challenge is *how* to measure the theoretical variable of interest. The study of attention spans a variety of disciplines with an equal variety of measures. These measures span a spectrum from self-report to brain imaging techniques (Orquin & Mueller Loose, 2013; Posner & Petersen, 1990). Research in the organisational sciences has typically favoured psychometric scales (Pierce & Aguinis, 1997), and this hasn't changed much over the past decades (Meißner & Oll, 2019). Whilst these measures are capable of measuring attention (Leroy & Glomb, 2018), scholars from other disciplines typically favour more precise objective measures of attention: e.g., eye tracking (Orquin & Mueller Loose, 2013) and thought probes (Wiemers & Redick, 2019). This is primarily because objective measures guard against individual biases (e.g., social desirability) and thus provide more internally valid measures of attention (Meißner & Oll, 2019). Marrying measures from cognitive science (e.g., eye tracking) with more conventional measures in organisational science (e.g., self-report) this chapter considers the validity of each of these approaches in the section "How to Measure Social Attention".

The third challenge is simulating the natural environment in which social attention occurs. A central tenet of social/applied psychology is the Lewinian principle of situationism (Ross & Nisbett, 2011): that individuals' (social) behaviour is in response to their immediate social environment. Therefore, to accurately

study social behaviours such as social attention, the experimental environment must be as realistic as possible, if not then the ecological validity of the social/applied psychological research is compromised. Examples of this are seen in the existing work on social attention which has found contrasting patterns of behaviour in the lab vs. real-world settings (Laidlaw et al., 2011), however, this is also a broader challenge for the entire field of organisational science. A novel approach to simulating naturalistic organisational environments is provided in the section "Where to Measure Social Attention".

What is Social Attention

I define social attention as the process of selecting a subset of the available social information present in the social environment for preferential processing. This definition is a minor restatement of the definitions used in past research[a] but focuses the study on "social information" as opposed to all information in one's environment (Cohen et al., 2012; Desimone & Duncan, 1995; Pitts et al., 2018). *Social information* refers to the observable behaviours of the social actors within an interaction. These behaviours can be non-verbal (e.g., body posture), verbal (e.g., dialogue), physical (e.g., a hug), olfactory (e.g., a smell), and so on, although notably, the majority of social information in work environments is shared through visual and auditory cues which, therefore, is the focus of this thesis. The term *social environment* refers to the information shared by individuals (i.e., actors) present in an interaction. Critically, all social actors are always conveying social information, this is because even a blank expression and silence is an observable behaviour (Mesman et al., 2009). By focusing on "selecting", this definition classifies attention as a discrete behaviour of the brain. However, whilst attention is a behaviour, it is important to note that attention can be shifted both consciously and unconsciously (Pitts et al., 2018), meaning that what we pay attention to in each moment is not necessarily a deliberative decision of the mind, but is in the pursuit of an incomplete goal. Focusing on this selection process distinguishes this research from other work on social attention examining how

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[a] This definition primarily draws from Pitts et al. (2018): "we refer to attention in the broadest sense as the process of selecting a subset of the available sensory information for preferential processing".

individuals process the social cues of others (e.g. Nummenmaa & Calder, 2009) and work on when multiple

individuals are paying attention together (i.e., shared attention, Shteynberg, 2015).

Combining the abundance of social information with the limits of human cognition, the challenge of

social attention becomes instantly apparent. Individuals must select a subset of their environment in each

moment to process, with the social environment rapidly changing in every moment, with new information

(e.g., sentences) only available for seconds and then disappearing. Therefore, the role of social attention in

selecting what information to pay attention to is critical in understanding how individuals comprehend the

social world around them, i.e., how they construct their social map, and effectively pursue their social goals.

To model how this social attention process unfolds within a social interaction consider the following example

of an interaction between social actors in a workplace setting:

Consider a scenario in which an individual is observing an interview with two social actors: an

interviewer and a candidate (see Figure 3). In this scenario, the interviewer is asking questions and the

candidate is responding; the observer is viewing this interaction. Throughout this episode both the

interviewer and the candidate are continually transmitting social information, verbally and non-verbally. If we

consider each behaviour from one of the social actors as a distinct piece of social information[b] (e.g., a spoken

sentence) then we can represent the information shared by each actor during the interaction as follows:

$$\text{Candidate: } C_1, C_2, C_3, C_4, C_5, C_6, \ldots C_n$$

$$\text{Interviewer: } I_1, I_2, I_3, I_4, I_5, I_6, \ldots I_n$$

In this case, the letters C and I denote pieces of information communicated by the candidate and

interviewer respectively, with C_1 through C_n and I_1 through I_n being the sequential pieces of distinct

information being shared over time. Note, that this model is oversimplified as it is not necessary that each

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[b] Note, social information refers to any information conveyed by social actors, for brevity below this it referred to as just "information".

actor shares the same amount of information, or that each piece of information lasts the same amount of time. For example, if a candidate speaks a lot, they will presumably share more information than a relatively quiet candidate (although a candidate not speaking can still be seen as communicating information). Further, individuals share a variety of social information at the same time, for example, their verbal cues and non-verbal cues. However, for the present purposes and given the observer's bounded capacity to attend to one source of information at a time (Pitts et al., 2018), it is most critical to determine what information the observer is selecting to attend to and not the quantity of the information available.

Therefore, the information that the observer is attending to can be represented as a string of selected behaviours from their social environment. For example, they could have first listened to the interviewer's question, then begun listening to the candidate's response, then shifted attention back to the interviewer's face to see how they are responding, then paid attention to how the interviewer is sitting, then returned to the candidate's previous response, and so on. Note, that this social attention process captures both when individuals are paying attention to the present-moment actions of the social actors (i.e., externalized attention) and when they are thinking about/considering something the social actor has done previously (i.e., internalized attention). This process of social attention of the observer can be represented as follows:

$$\text{Social Attention (Observer): } I_1, C_2, I_3, I_4, C_5\ldots$$

However, this model makes one problematic assumption: that the observer is always attending to the social information available in the environment. In other words, this model ignores the role of *inattention*, when individuals are *not* paying attention to their social environment. Inattention is often referred to as mindwandering or off-task thought (Smallwood & Schooler, 2015). Humans are prolific mindwanderers with current estimates suggesting that attention is on an individual's current task only 50% of the time (Killingsworth & Gilbert, 2010). It is important to recall that this mindwandering is not

'wasted attention' as an individual's mind inevitably wanders to unfulfilled goals that are potentially as warranting of attention as their current social situation (Mason et al., 2010). However, given the definition of social attention provided, any time spent not paying attention to the social information being communicated by social actors, can be categorized as individuals not paying attention, i.e., inattention.

This strict categorization is the result of the specific nature of social interactions. Because all social interactions are dynamic, and the information is transient if any information is missed it is effectively gone forever. This is unlike when people are paying attention to non-social tasks. For example, if an employee is reading an email and then begins to think about how they feel about the email, they can, after some time return to the email where they left off. This is not possible in a social interaction. Even if the content of thoughts is related in some way to the current task, any time spent paying attention to anything other than the social interaction means individuals will miss social information. This results in individuals having to "return" to the social interaction and having to quickly catch up to try to update their mental map of the social environment (Fiske & Taylor, 2013). Based on this, within the current perspective of social attention, all attention directed away from the current social information being conveyed is termed social inattention and is represented as follows:

$$Inattention: X$$

Incorporating social inattention into the model of social attention, we can now represent the observer's string of information being attended to more accurately. For example, observers might first attend to the candidate as they walk in, then focus on the interviewer's question, then focus on the candidate's response, then think about where the candidate's accent is from, then think about why accents are so different around the world, then pay attention again to the candidate's response, and so on. This stream of social attention can be represented as follows:

Social Attention (Observer): C_1, I_2, C_3, X, X, C_6...

This representation of social attention could demonstrate which social information individuals are selecting to attend to (or their inattention) over any given period. This could theoretically be measured down to the millisecond and could distinguish between whether verbal or non-verbal information is attended to, however, such measures do not exist at present and more importantly most research questions might not be interested in these minutiae of attention. Therefore, it is possible that individuals could examine the social attention process at a higher level. Three such operationalizations are presented below:

1. Researchers solely interested in the extent to which a certain individual receives attention from others, could represent attention to this individual as (1) and all attention to other actors as (0). Similarly, if the research question focuses on which of two focal actors receives more attention, then social attention can be modelled to only focus on social attention to these two social actors.

2. Researchers interested in mindwandering or inattention, which was recently theoretically discussed by Dane (2018), might only be interested in whether individuals were paying attention (1) or not (0).

3. Researchers who are only interested in one specific event occurring during a social interaction, can code attention to this event as (1) and attention to all other information as (0).

In sum, the model of social attention provided can (and should) be adapted based on the precision of the research question, and as long as social attention is being measured as a selective behaviour that is spread out over a period of a social interaction, then this can be considered social attention.

How to Measure Social Attention

All psychological measures are imperfect techniques to estimate a theoretical variable of interest. The model of social attention described above occurs in the black box of the mind and cannot be drawn

out verbatim. However, attention scholars have developed numerous methods that aim to approximate

this process (Meißner & Oll, 2019). These measures span numerous fields and use a variety of techniques.

This section considers three forms of measurement in detail that are used in the social and cognitive

sciences: self-report, thought probes, and eye tracking.

By focusing on these three measures of attention several techniques are omitted. First, this

dissertation does not measure attention using "time on task" as is often done in economics (Caplin, 2016).

Whilst this measure can be suitable for some non-social tasks, this measure is inappropriate for measuring

social attention. Most notably, this is because in a social interaction which is dynamic and social

information is transient, observers cannot spend more time observing a behaviour because they have no

control over how long that behaviour is present. However, in addition, using time as a measure of

attention is also problematic because it assumes all attention is focused on the current task. This becomes

an issue if someone is working on a task and their attention is distracted then they may end up spending

more 'time' on the task *because* during this time their attention is less focused on the task. Alternatively,

there could be an individual who finishes a task quickly because during that time their attention is focused

fully on the task at hand. Therefore, when considering the possibility of inattention, the amount of time

spent on a task could be inversely related to the amount of focused attention an individual devotes to a

task.

A second measure of attention not used is: measures of accessibility (Uhlmann et al., 2012). This

approach is common in cognitive science and has been used in organisational science (e.g. Leroy, 2009). It

is based on the principle that information that was attended to by an observer will be more cognitively

accessible than information that is not attended to (Uhlmann et al., 2012). Thus, if people paid attention

to a social actor talking about the ocean then related concepts such as "fish" will be more accessible to

these individuals than those who did not pay attention (Uhlmann et al., 2012). The accessibility of

information can then be measured using implicit measures such as a fill-in-the-blank task or lexical

decision task: e.g., when asked to complete this word SH_R_, someone paying attention to a conversation

about the ocean would more likely choose "SHARK" than "SHARP". This is a powerful approach. However, it requires significant fine-tuning to a situation, which makes it less suitable for measuring the full social attention process, it could be effectively used to probe one specific social event, e.g., an incident of workplace conflict.

Third, researchers have measured attention using brain imaging (Posner & Petersen, 1990). Neuroscientific approaches are gaining increasing interest in organisational science and certainly provide great potential for probing the black box of the mind (Waldman et al., 2017). However, the precision of these techniques is limited both temporally (i.e., when brain activation occurred) and proximally (i.e., where activation occurred). Further, techniques that maximize temporal and proximal capacities are typically expensive and not easily portable (Waldman et al., 2017). Finally, such techniques also require significant training for researchers and readers to operate along with significant background knowledge to interpret. For these reasons, the use of brain imaging techniques is not discussed in this section. Nevertheless, this approach will become increasingly suitable as the necessary equipment becomes more available. In particular, there is promise in electroencephalogram (EEG) measures that could approximate mindwandering states and thus test related research questions (Dong et al., 2021; Jin et al., 2019).

Next, the three measurement techniques used in this dissertation are described in detail and how they estimate social attention. These measures are psychometric scales, thought probes, and eye-tracking.

Psychometric Scales

Psychometric scales can measure participants' *perceived* attentiveness to their surrounding social environment. These measures provide a summative assessment of social attention. In other words, they ask individuals to recall the extent to which they were attentive over a given period. Theoretically speaking, participants are being asked to "count" the amount of information from a particular social actor, or the amount they mindwandered, and then determine where this ranged on a subjective scale from a low to high amount of attentiveness. This is represented in the diagram below based on the above definition and modelling of social attention:

Social Attention

$$C_1, I_2, C_3, X, X, C_6, I_7, I_8, X, X, C_{11}, I_{12}, X, X, C_{15}, I_{16},$$

Summarize
(e.g. How much did you attend to the candidate? How much did your mindwander?)

A variety of such measures have been used previously in research, most of these measures focus on general levels of attentiveness (Brown & Ryan, 2003; Judah et al., 2014; Mrazek et al., 2013). These measures are not inappropriate for measuring social attention, however, it is worth noting that they provide limited precision about the information being selected for processing and are thus most appropriate for higher-level research questions, e.g., to what extent does an independent variable affect attentiveness.

Research has used different psychometric scales to assess the extent to which individuals are attentive to their environment. Measures from organisational science include the measure of off-task vs. on-task thoughts developed by Kanfer et al. (1994) and a measure of attentional focus developed by Rothbard (2001). Both measures attempt to understand how attention is allocated over time and thus gauge the overall attentiveness of participants. More specific measures of mindwandering have also been used in psychological science more broadly (e.g., Mrazek et al., 2013), measuring mindwandering both on a trait and a state level. A recently developed state-level measure of mindwandering was developed by Seli et al. (2016) and distinguishes between intentional and unintentional mindwandering. Further, this measure has been shown to correlate with mindwandering measured using thought probes; seen as a gold standard measure of mindwandering and discussed below (Seli et al., 2016). These three all measure similar processes that can be viewed as general attentiveness, with mindwandering being the inverse of attentiveness (i.e., inattentiveness).

However, returning to the limitation of these variables in measuring the selective nature of social attention, this drawback is largely due to the summative nature of this measure. Nevertheless, given the

numerous benefits of psychometric scales such as ease of administration, generalizability across different scenarios, and aggregation across multiple items to reduce standard error (Meißner & Oll, 2019), it is worth exploring whether the selective nature of attention can be approximated using this approach. To do so, the aforementioned scales can be adapted to measure specific attentiveness to a social actor or event. For example, participants would be asked, to what extent are you attentive to the interview candidate *or* the interviewer. A scale developed by Rothbard (2001), was adapted to measure this selective nature of attention, by replacing the target of attention of "work" with each of the social actors (see Measures appendix). In this adapted version, the amount of attentional focus allocated to a specific social actor or event over the course of the interaction, can be viewed as a measure of "selective attentiveness".

Thought Probes

Thought probes measure where a participant perceives their attention to be in a specific moment during a scenario (Wiemers & Redick, 2019). This is accomplished by asking the participant: "where is your attention right now?". These question probes can be randomly distributed during a scenario to give momentary snapshots of what social information participants are selecting to pay attention to. Given that these snapshots are randomly assigned and that there are a sufficient number of probes (i.e. data points), this can then be seen to provide an approximation of where attention is allocated across the entire scenario (Smallwood & Schooler, 2015). In other words, this measure approximates the social attention process by randomly sampling from the underlying process of social attention. For example, a thought probe could ask every 20 seconds where participant's attention is and use the frequency of times they reported "mindwandering" as an estimation of the overall mindwandering. This measurement approach is diagramed below:

Social Attention

$$C_1, I_2, C_3, X, X, C_6, I_7, I_8, X, X, C_{11}, I_{12}, X, X, C_{15}, I_{16},$$

Report

What are you Paying Attention to Right Now?
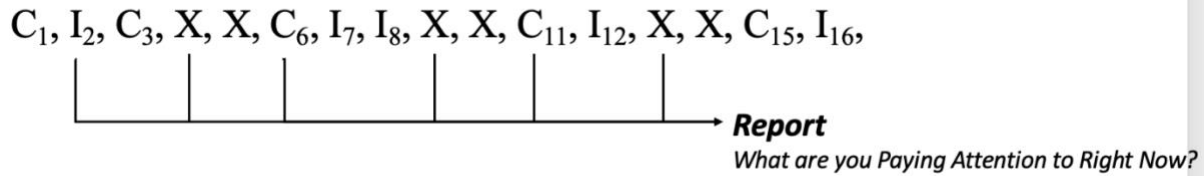
The thought probe measure is seen as a benchmark in research on inattention/mindwandering in applied settings (Robison et al., 2019). For example, scales measuring mindwandering will typically be correlated with mindwandering thought probes to show construct validity (Mrazek et al., 2013; Seli et al., 2016). Similarly, validation of neurological and eye tracking measures of attention are also compared with thought probes to establish convergent validity (Klesel et al., 2020).

This measure also has high content validity for measuring social attention given that probes can ask participants to report if they are mindwandering and if not, which social actor they are attending to. Further, probes can even measure the nature of the social information being attended to. For example, one major distinction discussed above is to be made between internalized social attention, in which one is considering and introspecting on social information that has been shared in the past, and externalized social attention, in which one is attending to the social information conveyed by a social actor in a that specific moment. Within a social interaction both of these can be considered social attention and from a participant's point of view it is challenging to differentiate between how much they paid attention to a social actor's moment-to-moment actions (i.e., externalized attention) and how much they thought about the social actor's past behaviours (i.e., internalized attention). However, with a thought probe, this distinction can be made by focusing on a participant's response to one specific moment in time.

The precision of thought probes also comes at a cost. The first major limitation is that thought probes require an interaction to be interrupted. This creates an unnatural situation and could compromise the measure of the variable of interest (Wiemers & Redick, 2019). For example, it could be that when participants are being thought probed, they pay attention more because they are being reminded of any

inattentiveness. A second major limitation is that thought probes are self-reported, meaning the challenges associated with social desirability, common method variance, and an individual's inability to accurately gauge where their attention is, are all still sources of error (Hinkin, 1998). A final major limitation is that thought probes are not easy to implement, requiring multiple responses from participants over time (Wiemers & Redick, 2019), and thus are hard to utilize in some research contexts.

In sum, thought probes provide a precise measure of social attention. Therefore, this measure is used as a benchmark of construct validity that the other two measures (psychometrics and eye-tracking) will be compared to. However, given the limitations of using thought probes, establishing other measures of social attention that correlate with thought probes, but a non-intrusive and not self-report could allow for an easier and more generalizable measure of social attention.

Eye Tracking

Eye tracking is a non-intrusive and objective measure of attention. Through eye-tracking research can try to measure where participants' visual attention is down to the centimeter and when it is there down to the millisecond at any point across a scenario (Clay et al., 2019). For this reason, eye-tracking is viewed as a gold standard for research on visual attention (Orquin & Mueller Loose, 2013). However, it is unknown whether eye-tracking can accurately measure the auditory information individuals are attending to. This is a major limitation for research on social attention given that verbal information is a primary form of communication within social environments. Nevertheless, the benefits of eye-tracking as a measure of social attention are so substantial that assessing the extent to which it can approximate the social attention process is worth pursuing. The continual measuring of eye tracking is represented below:

Social (Visual) Attention

$$C_1, I_2, C_3, X, X, C_6, I_7, I_8, X, X, C_{11}, I_{12}, X, X, C_{15}, I_{16},$$

→ **Measure**

Gaze direction, Pupil dilation, Eye Openness
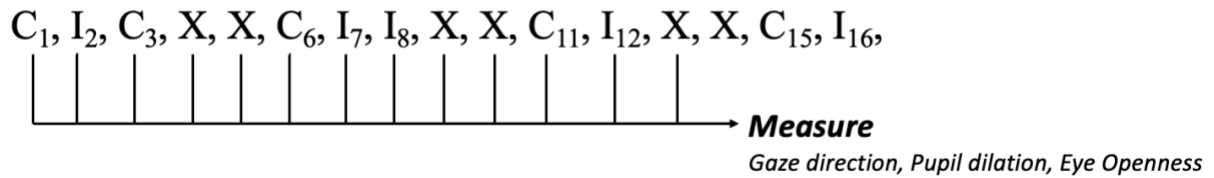
Whilst the eyes do not control auditory attention there are theoretical rationales for why the two would be related. Vision is by far the most developed sense in the human brain, with roughly 50% of the cortex devoted to processing visual information (Hubel & Wiesel, 1979). As a result, vision is frequently incorporated into other sensory processes. For example, when we listen to someone speak, individuals typically also focus on the lips moving to provide further information on the exact words they are saying (Dodd & Campbell, 1987). Lip-reading provides individuals with lots of information for understanding language demonstrated by a deaf individual's ability to understand spoken language based almost exclusively on reading lips (Conrad, 1977). Eye contact is also a signal to other people that we are paying attention (Nummenmaa & Calder, 2009). This is why it is often seen as rude not to look at people when they are talking, as it signals disinterest (Senju & Johnson, 2009). Consistent with these theoretical perspectives, research on visual attention in naturalistic environments has shown that during a social interaction individuals focus roughly 75% of their gaze on the individuals currently speaking (Argyle & Ingham, 1972; Hirvenkari et al., 2013). More intriguingly, research has found that even when individuals watch a video of people speaking and the visual information is stopped (i.e. the video is frozen) but the audio information continues, individuals continue to direct their visual attention to the person speaking (Dawson & Foulsham, 2021). In other words, there is a significant overlap between visual and auditory attention. Therefore, potentially to support comprehension through lip-reading and potentially out of social habit, it is possible that individuals *gaze* at the people they are paying attention to. In sum, it is theoretically plausible that the direction of visual attention is meaningfully correlated with the direction of

auditory attention. Importantly, even if visual attention is not a perfect proxy for auditory attention, given the precision of the measure it could still provide a reasonable approximation of social attention.

Eye tracking also provides data on more than gaze direction. Past research has used both number of fixations to a location and pupil dilation as a means to measure attention (Orquin & Mueller Loose, 2013). Further, research has begun to combine these measures in order to provide more reliable estimates of where an individual's attention is at any given moment. The most promising evidence in this respect has been work on mindwandering. Researchers have identified specific eye signatures associated with mindwandering during reading, e.g. increased number of saccadic (eye) movements, dilation of the pupils, and location of eye fixations (Brishtel et al., 2020; Jang et al., 2020; Uzzaman & Joordens, 2011; Zhang et al., 2020). Further, scholars have found preliminary evidence that this approach could be generalizable across real world environments (Klesel et al., 2020). This research is unlikely to be able to provide information on selective attention, however, if an accurate measure of general attentiveness could be garnered using eye-tracking data alone this would provide a powerful unintrusive tool for examining social attention.

Summary

This section provided three potential measures of social attention. They vary in terms of level of precision and ease of implementation. The benchmark measure is viewed as thought probes as these demonstrate the highest content validity in terms of approximating the social attention process. However, assessing the validity of the other measures would help address the major limitations of thought probes and provide researchers with methods that can be flexibly adapted to different research questions.

Measuring Social Attention in Realistic Environments

The real social world we live in, and the social world researchers simulate in their experiments are worlds apart. For example, if we compare a vignette study – one of the most common experimental tools for examining participant responses to social events (Aguinis & Bradley, 2014) – with the real-world experience

of a social event the differences are numerous. To name a few: 1) The real world is an immersive 360 environment, a vignette is typically a written block of text displayed to participants on their computer screen, 2) The real world is multisensory, a vignette is typically only visual although it can be video based, 3) The real world is dynamic and transitory with the narrative constantly progressing, a vignette is stationary and can typically be read at the participants own pace. If these limitations of vignettes are too numerous social scientists can take two approaches. One option is to relax the attempt to simulate a social event (i.e., external validity) and use a more abstract measure, e.g., measuring how individuals process social stimuli such as faces (Ma et al., 2015). However, such processes have also been subject to growing criticism as there are differences in how we process social stimuli in a lab and how we process the same social stimuli in an realistic setting (Laidlaw et al., 2011). Another option that social scientists can take is to relax their experimental control (i.e., internal validity) and examine attitudes and behaviours in field settings. However, whilst such approaches are typically favored by organisational scholars, they limit the ability of researchers to make the causal attributions at the heart of the scientific endeavor (Meißner & Oll, 2019).

The challenges described above are the results of the classic trade-off between experimental control and realism (Fox et al., 2009): see Figure 4. This challenge is by no means new and numerous fields have come up with innovative ways to address these limitations, however it is particularly prominent in the study of social attention. Examining attention in social environments requires a high degree of control as experimenters need to be able to determine with reasonable precision what social information participants are attending to, or if they are paying attention at all (Posner & Petersen, 1990). These are both objective variables meaning they are less amenable to the subjectivity in psychometric scales typically used in experimental research (Meißner & Oll, 2019). However, it is also imperative that this attention occurs in a realistic social environment (Laidlaw et al., 2011). If not, the critical social nature of this attention process - i.e., that the information is immersive and dynamic - becomes irrelevant and the paradigm becomes more similar to the experiments conducted by cognitive scientists examining the micro-processes of attention (e.g., Posner & Petersen, 1990). The maximization of this tradeoff can be found on rare occasions such as field experiments,

that utilized the internally valid experimental method in a real world environment, however, these studies are generally the exception and not the norm (King et al., 2013). Therefore, whilst the current trade-offs between control and realism in the social sciences is likely adequate for a number of fields of research, for the study of social attention it is imperative that there is a paradigm shift. This dissertation proposes that paradigm shift should be toward using virtual reality (VR).

Virtual Reality

Virtual reality is an immersive simulated environment (Fox et al., 2009). The potential of using this as a research tool has been an exciting frontier in psychological research for decades. Early research using VR examined how individuals interact with simulated social environments measuring variables such as physical social distance and gaze (Bailenson et al., 2003; Loomis et al., 1999). There has also been work on how individuals respond to different leaders in VR. For example, Hoyt & Blascovich (2003) manipulated the leadership styles (transformational vs. transactional) in a virtual environment and found that virtual leaders inspired the same level of group performance and cohesiveness that real world leaders did, suggesting that virtual experiences can generate motivation in employees. However, whilst this initial research was promising, the field was also held back by the cost of using VR. This has begun to drastically change as VR devices have plummeted in price due to a growing interest in the technology as a training and gaming device (Pan & Hamilton, 2018). As a result, there is a renewed interest in VR from psychological researchers and particularly social psychologists interested in investigating how individuals interact with realistic social environments (Fox et al., 2009; Loomis et al., 1999; Pan & Hamilton, 2018; Rizzo et al., 2004)

The potential of virtual reality as a research tool is fully realized in organisational research. As discussed above, organisational research requires a high degree of realism in order to make meaningful practical contributions to businesses, managers, and society. Using VR, organisational research can accurately simulate realistic environments. For example, participants can be placed in a realistic (work) scenario – e.g., job interview or board meeting – by recording a 360-degree video of this scenario and viewing it through a VR

headset. The scenario also has 360 sounds and is almost indistinguishable from the real visual and auditory world. Therefore, with VR, social information is conveyed in the same format as the real world. Information is dynamic - i.e., constantly emerging, and non-repeatable – meaning if participants miss a facial expression or spoken statement from a social actor because they were mindwandering, they cannot "rewind" that experience. Information is also 360, meaning that, just like in the real world, when participants select to attend to certain information (e.g., the reaction of a subordinate) they are by virtue sacrificing other information (e.g., the reaction of their supervisor).

Another substantial benefit of VR is that it creates a sense of presence for participants in their (simulated) experimental environment. Presence is defined as the feeling of being physically and spatially located in an environment (Schwind et al., 2019). The reason that VR is able to mimic the social world and create a sense of presence is because the social world we live in is already a simulation; see Literature Review. The power of this presence has been demonstrated numerous times in VR. For example, VR can lead to virtual embodiment, a phenomenon when individuals believe a virtual body that responds to their movements is a physical extension of themselves (Kilteni et al., 2012). Participants can also feel present in unrealistic environments such as spaceships, or when adopting the body of someone else (Bailenson, 2018; Yee & Bailenson, 2007). Presence is beyond the typical goals of realism in experimental research that focus on making a scenario that could feasibly happen in the real world (Aguinis & Bradley, 2014). With VR, presence creates heightened emotional responses in participants because they feel they are actually within the scenario. This has allowed research using VR to study moral dilemmas involving life and death (Pan & Slater, 2011; Patil et al., 2014), Milgram's obedience experiment (Slater et al., 2006), and rare events that occur for employees (e.g., safety malfunctions, Sacks et al., 2013). Social presence has also been shown to impact social attention, as individuals pay attention differently in an environment when they feel other are present (Shteynberg, 2015). In sum, VR matches the naturalistic visual and auditory experience of social interactions (Pan & Hamilton, 2018) which creates a sense of presence in a scenario and in turn leads to more naturalistic behaviour (Diemer et al., 2015; Pan & Hamilton, 2018).

Virtual reality is also simulated, meaning it is constructed by researchers and thus the events that occur in VR can be meticulously controlled. Therefore, actors can be hired to play social actors in an interaction and their appearance and behaviours can be prespecified by researchers. Using the classic vignette approach (Aguinis & Bradley, 2014), these scenarios can then be altered to test the experimental effect of certain factors (e.g., the content/script, the actors, the environment) or to examine how different individuals respond to the same scenario. For example, research could examine how unethical behaviour by social actors is attended to, perceived, and responded to differently depending on the attributes of the offender, building on theory of Barclay et al. (2017).

In essence, VR Vignettes are similar to past iconic social psychological work using confederates, e.g., Asch's conformity experiment. However, these vignettes provide even higher degrees of control and are also easily repeatable for different participants allowing for greater sample sizes. The repeatability is particularly critical given the reproducibility crisis in psychological science (Open Science Collaboration, 2015).

The high degree of realism and control available in VR make it an ideal method for examining social attention. Foremost, it preserves the Lewinian principle of situationism by providing a simulated environment that is comparable to the social environment individuals encounter in the real world. Further, it also allows for the use of an experimental approach to test causal relationships between variables. It is also worth noting that advances in VR have incorporated eye-tracking, making this measurement of attention relatively seamless (Clay et al., 2019). Additionally, research has also used brain imaging in VR, providing the potential to study neurological responses in work events.

Despite the benefits of VR there are still limitations. One major limitation is that in VR involving 360 videos the entire scenario is prerecorded, meaning that participants have little control over what happens and thus act as an observer. Further, whilst VR does generate a greater sense of presence than most laboratory approaches it is still fundamentally a simulation meaning that there are still benefits to measuring social variables in the field even if that does compromise control. Finally, there are both important practical and ethical considerations for research using VR. Practically, VR requires the purchasing of necessary

equipment which can vary greatly in price. Also, being in VR for prolonged amounts of time can lead individuals to experience motion sickness (Stanney & Kennedy, 2010). Ethically, by generating a sense of presence, researchers also expose participants to powerful experience of discomfort and negative emotions (Pan & Slater, 2011). Whilst these limitations do not prevent the use of VR as a research tool, they do indicate the need for caution.

Method

This study examined the validity of different measures of social attention described above and provided a "proof of concept" study for virtual reality vignettes. A VR vignette was created using a 360-video and two actors (job candidate & interviewer): scripts for the scenarios are available at the OSF page (see VR Vignette Script). Vignettes were viewed using the Vive Pro Eye which has built in eye tracking hardware.

Participants

A total of 318 participants were recruited through the university subject pool in return for credit. Technical difficulties with the VR (e.g., video lagging due to computer being low on battery) led to 13 participants being excluded from analyses. The final sample was thus 305 participants of which 60% were female and the average age was 21.17 years old (SD = 1.51).

Participants were allocated across four experimental conditions. These conditions are described in detail in Chapter 2, but for the analyses conducted in this chapter all data was collapsed across condition and analyzed together.

Participant Safety. All participants completed a scale measuring simulation sickness before starting the VR vignette and were told they could exit the VR at any point by taking off their headset; note, no participants reported simulation sickness to the extent that they couldn't take part in the study (Stanney & Kennedy, 2010). Participants then completed the same scale immediately after completing the VR, again with no participants reporting major adverse effects.

Procedure

Participants viewed a VR vignette of a job interview; the vignettes varied in length from 11 to 14 minutes. This interview simulated a structured interview with a job candidate, an interviewer, and the participant playing the role of an additional interviewer.

During the VR Vignette, participants were probed to report where their attention was in a specific moment, with a screen appearing and with three response options (see measures section). Participants responded using a keyboard, with the keys '1', '2', '3', corresponding to the different response options. Before starting the vignette, the participants were given a verbal instruction on how to answer the thought probed measures and any questions the participants had were answered.

A minority of participants (N=36) completed the VR vignette without the thought probes in order to examine whether the presence of these probes affected other measures of attention.

Participants' gaze direction was tracked during the interview using the Vive Pro Eye's built-in eye tracking hardware. Before starting the VR vignette, each participant completed an eye calibration exercise run through the computer program Steam VR. After the interview, participants completed all survey measures, including psychometric measures of general attentiveness.

VR Vignette

The VR vignette is of a job interview for an assistant manager position at an unnamed organisation. The interviewer follows a structured interview process based on the recommendations of the Society of Human Resource Management and research conducted by Carson et al. (2005). The structured interview focuses on gauging participants' cognitive ability, emotional intelligence, and teamworking/leadership abilities; questions were adapted from Carson et al. (2005). Within the scenario, the participant is seated next to the interviewer and is directly addressed by the interviewer at the beginning of the vignette; this is to increase the participant's sense of presence (Schuemie et al., 2001). The participant is told that the interviewer will ask all the questions and will always follow the same script

and explains to the interviewer that all they need to do is observe and provide an evaluation of the candidate afterwards.

The scripts for this interview were developed in collaboration with a script writer for screen and theatre. After the first version was created the script was read by two human resources professors who provided feedback. Following their feedback and necessary revisions, the script was read by four human resources practitioners (with at least 10 years of experience) who provided feedback on the realism of the questions and answers. Each gave feedback on the realism of the script, and the script was adjusted accordingly.

Social Attention Measures

For further details on all measures listed below (including full scales) see the document titled "Social Attention Measures" on the OSF page.

General Inattentiveness. A 5-item scale measuring off-task thought developed by Kanfer et al. (1994) measured general (in)attentiveness. The scale has been adapted to be a state measure and the focus of the measure has been shifted from the "task" to the "interview". Sample items include, "I took "mental breaks" during the interview" and "I daydreamed while listening to the interview". Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α = .72.

General Attentiveness. A 4-item scale measuring attentional engagement developed by Rothbard (2001) was used as a measure of general attentiveness. The original form scale has been adapted to be a state measure and the focus of the measure has been shifted from "work" to the "interview". Sample items include, "I spent a lot of time paying attention to the interview," and "I concentrated a lot on the interview". Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α = .95.

Mindwandering (Intentional). A 4-item scale developed by Seli et al. (2016) was used to measure intentional mindwandering. Sample items included, "I allowed my thoughts to wander on purpose" and "I allowed myself to get absorbed in pleasant fantasy". The scale has been adapted to measure state intentional mindwandering. Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α=.77.

Mindwandering (Unintentional). A 4-item scale developed by Seli et al. (2016) was used to measure unintentional mindwandering, sample items include, "I found my thoughts wandering spontaneously" and "I mindwander even when I'm supposed to be listening to the interview". The scale has been adapted to measure state intentional mindwandering. Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α=.85.

Selective Attentiveness (Candidate). The 4-item scale measuring attentional engagement developed by Rothbard (2001) was used to measure selective attentiveness to the job candidate. The scale has been adapted from the "general attentiveness" scale above with the focus of the measure being shifted from the "interview" to the "candidate". A sample item is "I spent a lot of time paying attention to the candidate". Sample items include "I spent a lot of time paying attention to the job candidate" and "I concentrated a lot on the job candidate". Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α=.93.

Selective Attentiveness (Interviewer). The 4-item scale measuring selective attentiveness to the job candidate (Rothbard, 2001) was adapted to measure selective attentiveness to the job interviewer. To do so, the focus of the measure was shifted from the "interview" to the "interviewer". A sample item is, "I spent a lot of time paying attention to the interviewer". Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): α=.97.

Thought Probes. Thought probes measured attention throughout the VR Vignette. Participants were probed roughly every 25-35 seconds period (22 probes in total). The exact time of these probes was first generated randomly and then adjusted so that 20 of the probes occurred when the candidate was speaking, and 2 occurred when the interviewer was speaking. The spacing of the probes was the same for participants within the same condition but varied slightly across conditions. Note, a total of 36 participants were assigned to a "no probe" condition and thus did not receive any probes.

Probes had three response options. These response options were developed based on research on information processing (Oppenheimer & Kelso, 2015b) and capture mindwandering along with distinguishing between internalized and externalized attention. The probes were written using language that would be

familiar to the participants and were explained by the principal investigator to each of the participants before starting the VR Vignette. The description of the three probes is presented below and participants were instructed to answer the question based on what they were doing when they video stopped:

1. **Listening/Watching:** Paying attention to what the candidate/interviewer was saying or doing in that moment

2. **Evaluating:** Thinking about the candidate's past responses or interviewer's questions

3. **Mindwandering:** Thinking about something unrelated to the interview, e.g., personal life or things in the room.

Responses from thought probes were coded as binary variables (0/1) for each response option. This was then summed across the probes for analyses across participants. Exploratory analyses also looked at longitudinal analyses within participants.

Eye Tracking. Eye tracking was measured using the Vive Pro Eye (see specification on the following page). All data available from the eye tracking software was recorded and stored. Analyses from eye tracking data focused on: a) time spent looking at candidate/interviewer, and b) number of unique fixations to the candidate/interviewer, as these are two variables with the high content validity, i.e., meaning they map most closely onto the construct of social attention.

To determine these metrics a region of interest (ROI) was assigned to the VR vignette. Two separate ROIs were created: one for the candidate and one for the interviewer. The ROI for the candidate specified exactly where the candidate was at each point in the interview and marked this position. The Vive Pro Eye automatically computes the amount of time an individual's eye gaze falls within in this region and the number of times their eye moves toward this region.

Additional Measures

Additional measures were included in this study in order to assess discriminant and predictive validity.

Memory. Participant's memory of the VR vignette was measured for the candidate and the interviewer separately. Correct answers for this test were scored as 1, incorrect answers were scored as 0. For a similar approach see Mason et al. (2010). For the candidate, there were 12 questions (see OSF "Memory Measures") with a maximum score of 15 possible. For the interviewer, there were 3 questions (see OSF "Memory Measures") with a maximum score of 6 possible.

Core Affect. Affective states were measured using the affect grid (Russell et al., 1989). This is an 8x8 grid with two dimensions – valence and activation – each ranging from 1 to 8.

Warmth & Competence. In line with the stereotype content model, we measured the two key dimensions of person judgment in warmth and competence. Each was measures separated using three items (Warmth: warm, kind, understanding; Competence: competent, skillful, capable) developed by Fiske et al. (2007). Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree") : warmth (α=.88); competence (α=.94).

Attractiveness. Candidate attractiveness was measured using two items, "How attractive do you think the candidate was?" and "How good looking was the candidate?". Items were rated on a Likert scale (1 "Not at all" to 5 "Very"): α=.82.

Analysis Plan

Analyses were pre-registered in the dissertation proposal (see OSF). This described three types of validity for each measure: convergent, divergent, and predictive. It also included a pre-registered interpretation for the correlation coefficients as follows: .0-.19 very low correlation; .2-.39 low correlation; .4-.59 medium correlation; .6-.79 high correlation; .8-1.0 very high correlation.

Results

The following results are separated into the three validity tests for each measure. Summary statistics are presented in Tables 2, 3, and 4.

Predictive Validity

The first validity test examines whether the measures of social attention were related to an immediate downstream cognitive process: memory. To do so the measures of social attention were correlated with the memory of candidate statements. All results are summarized in Table 2.

Psychometric Scales. Each of the six scales measuring attentiveness were correlated with memory of candidate statements. Results demonstrate that each of the generalized self-report measures is significantly correlated with objective memory; attentional engagement ($r_{(only\ correct)}$=.24, p<0.001; $r_{(correct\ -\ incorrect)}$=.22, p<0.001), off-task thought ($r_{(only\ correct)}$=.23, p<0.001; $r_{(correct\ -\ incorrect)}$=.23, p<0.001), intentional mindwandering ($r_{(only\ correct)}$=.23, p<0.001; $r_{(correct\ -\ incorrect)}$=.20, p<0.001), and unintentional mindwandering ($r_{(only\ correct)}$=.23, p<0.001; $r_{(correct\ -\ incorrect)}$=.22, p<0.001). Results for self-report selective attention measures also significantly predicted memory but the correlations were notably lower: attentiveness to candidate ($r_{(only\ correct)}$=.13, p=0.025; $r_{(correct\ -\ incorrect)}$=.09, p=0.084); attentiveness to interviewer ($r_{(only\ correct)}$=-.13, p=0.019; $r_{(correct\ -\ incorrect)}$=-.14, p=0.013). Note, consistent with the selective nature of attention, attention to interviewer was negatively correlated with memory of candidate information. In sum, each of the psychometric scales passed predictive validity but the correlations are notably stronger for measures of general attentiveness/inattentiveness. However, overall, generalized measures of attention performed better than selective measures suggesting these approaches might be more efficacious.

Thought Probes. Count variables for the three response options – Externalized Attention, Internalized Attention, and Mindwandering – were generated. There were technical failures in saving the data for 41 participants leading to data being lost, in addition 36 participants were in the "no probe" condition, leaving a sample of 228 participants with full thought probe data. On average, of the 22 probes, individuals reported externalized attention 55% of the time, internalized attention 30% of the time, and mindwandering 14% of the time. It is interesting to note that this level of mindwandering is much lower than that found previously by Killingsworth and Gilbert (2010), which was roughly 50% of the time. However, it is also worth noting that in the VR vignette individuals had a salient goal to listen to the candidate which could have decreased mindwandering.

Results found evidence for the predictive validity of the thought probe measures. However, only mindwandering was significantly correlated with candidate memory ($r_{(only\ correct)}$=-.17, p=0.009; $r_{(correct - incorrect)}$=-.18, p=0.008). However, the separation of externalized or internalized attention did not individually predict memory; note, that because this was an ipsative measure, combining externalize and internalized attention into one scale did predict memory as this is the exact inverse of mindwandering.

Eye Tracking. Primary analyses correlated both total time spent looking at the candidate and number of unique fixations on the candidate with memory of candidate responses. There were technical failures in saving the data for 96 participants, leaving a sample 212 participants with full thought probe data. Results found that neither of these measures showed predictive validity: total time ($r_{(only\ correct)}$=.03, p=0.636; $r_{(correct - incorrect)}$=.05, p=0.491) or number of fixations ($r_{(only\ correct)}$=-.02, p=0.822; $r_{(correct - incorrect)}$=.05, p=0.501). In sum, primary analyses of eye tracking data found that this was not a valid measure of social attention.

Discriminant Validity

To test discriminant validity, all measures of social attention were correlated with measures of core affect, valence and activation. In addition, measures of social attention were corelated with social perceptions of the candidate attractiveness, warmth, and competence. Divergence was pre-registered as very low to medium correlation. All results are summarized in Table 3.

Psychometric Scales. Analyses are reported for generalized and selective attention separately. Generalized attentiveness was significantly correlated with valence (r=.32, p<.001) and activation (r=.31, p<.001). All measures of generalized inattention were significantly correlated with activation (r=-.24/.31, all p<.001) but not with valence (r=-.01/-.11, all p>.05). For social perceptions, warmth was significantly correlated with generalized attention (r=.35, p<.001) and all measures of generalized inattention (r=-.17/-.22, p<.01). Competence was significantly correlated with generalized attention (r=.22, p<.001) but not with measures of generalized inattention (r=-.00/-.08, p>.05). Attractiveness was significantly correlated with generalized attention (r=.17, p=.002) but not with measures of generalized inattention (r=.02/-.04, p>.05). Importantly, all significant correlations were low or medium indicating the constructs were divergent.

Interestingly, there also appears to be consistent differences between covariates and general attentiveness vs. inattentive suggesting that these measures might not be simply the inverse of one another but qualitatively distinct constructs.

For selective attention, attention to candidate was significantly correlated with valence ($r=.29$, $p<.001$), activation ($r=.25$, $p<.001$), warmth ($r=.34$, $p<.001$), competence ($r=.15$, $p=.011$), and attractiveness ($r=.23$, $p<.001$). However, attention to interviewer was not significantly correlated with any of the variables ($r=-.07/.11$, all $p>.05$). Again, all significant correlations were low or medium indicating the constructs were divergent.

Thought Probes. Results from the thoughts probes are separated for each of the different response options. Mindwandering was significantly correlated with valence ($r=.26$, $p<.001$), activation ($r=.26$, $p<.001$), warmth ($r=.35$, $p<.001$), competence ($r=.24$, $p<.001$), and attractiveness ($r=.16$, $p=.016$). Externalized attention was significantly correlated with valence ($r=.15$, $p<.024$), warmth ($r=.35$, $p<.001$), and competence ($r=.23$, $p<.001$), but not attractiveness ($r=.11$, $p=.096$) or activation ($r=.05$, $p=.420$). Externalized attention was not significantly correlated with any of the measures ($r=-.11/.11$, all $p>.05$). Importantly, all significant correlations were low or medium indicating the constructs were divergent.

Eye Tracking. Neither total time spent looking at the candidate nor fixations were significantly correlated with any of the measures used to examine divergent validity ($r=-.08/.03$, all $p>.05$). Whilst this does indicate divergent validity given the registered criteria, it is important to recall that neither of these measures demonstrated predictive validity.

Convergent Validity

To assess convergent validity the measures of social attention were correlated. Given that they were all proposed to measure the same underlying construct, all valid measures were expected to significantly correlate with each other. All results are summarized in Table 4.

Results were largely consistent with the above validity tests. Psychometric measures of general attentiveness and general inattentiveness were significantly negatively correlate with each other (all $r<-.3$, $p<.001$), and measures of general inattentiveness were positively correlate with each other (all $r>.6$, $p<.001$).

Psychometric measures of general attentiveness and general inattentiveness correlated with the measure for selective attention to candidate (all $r>.3/r<-.3$, $p<.001$), however, none of the measures of attention correlated with selective attention to the interviewer (all $r<.1$, $p>.05$). Similarly, mindwandering measured by thought probes significantly correlated with measures of general attentiveness ($r=-.58$, $p<.001$), general inattentiveness (all $r>.36$, $p<.001$), and selective attention to candidate ($r=-.42$, $p<.001$), but not with selective attention to the interviewer ($r=-.09$, $p=.191$). In sum, all the measures that passed the above validity tests showed convergent validity.

Results for the thought probe measures of externalized and internalized attention were less consistent. Externalized attention was significantly correlated with all measures of general attentiveness/inattentiveness and selective attention to candidate (all $r>.15$, $p<.05$), but not with selective attention to the interviewer ($r=.06$, $p=.332$). However, internalized attention was only significantly correlate with the measures of generalized attention ($r=.27$, $p=.001$) but not measures of generalized inattention or selective attention (all $r<.11$, $p>.05$). This provides some indication of the different components of attention these measures are picking up on.

Results with eye tracking measures (total time and fixations) did not significantly correlate with any other measures of social attention, with the sole exception of total time spent looking at the candidate negatively correlating with attention to the interviewer ($r=-.20$, $p=.003$). Therefore, these measures did not show consistent convergent validity.

Effects of Thought Probes

One registered analysis was to examine the effects of thought probes on participants attention during the VR vignette. In particular, a concern raised by the dissertation committee was that including the probes would serve as a reminder for individuals to pay more attention during the interview. To investigate this, the social attention of participants in the Probe (N=228) and No Probe (N=36) conditions were compared: note, only valid attention measures defined above were used in analyses. Results found no difference in self-reported social attention between the two groups: generalized attentiveness ($t(303)=-0.83$, $p=.409$), generalized inattentiveness ($t(303)=0.27$, $p=.786$), mindwandering ($t(303)=0.52$, $p=.604$), selective attention to candidate ($t(303)=-0.57$, $p=.568$), or selective attention to interviewer ($t(303)=-1.00$, $p=.318$). There were also no

differences in social perceptions of the candidate (i.e., attractiveness, warmth, and competence) or core affect (i.e., valence and activation) across the conditions; results available on request. The only observed difference was that individuals in the No Probe condition showed a better memory of candidate statements (M=9.92, SD=2.56) than those in the Probe condition (M=8.94, SD=2.34; t(303)=-2.32, p=.021). However, it is important to note that this difference could be down to the significantly shorter length of the VR vignette in the No Probe condition and reduced cognitive load on participants. Further, it is worth noting this effect is in the opposite direction to what was expected (i.e., individuals in the Probe condition remember less), which means the probes are not operating to keep participants engage. In sum, there was no observed effect of Probes on social attention or social perceptions, suggesting that the effect of probes is limited to negligible; consistent with past research (Robison et al., 2019; Wiemers & Redick, 2019).

Exploratory Analyses

A variety of additional analyses can be conducted using this data set, including the hypothesis tests in Chapter 2. However, the focus of the analyses reported below will be in a) replicating previously observed effects in the social/applied psychology literature in order to establish the effectiveness of the VR vignette approach and b) exploratory analyses made possible using this data. These are not exhaustive but aim to provide a interesting sample of possible analyses in order to stimulate future research.

Mindwandering and Negative Mood. The first set of analyses concerned a previously published finding that mindwandering is negatively related to mood in field settings (Killingsworth & Gilbert, 2010). This effect is replicated in the current data set with probe caught mindwandering – the same measure used by Killingsworth and Gilbert (2010) – being negatively correlated with emotional valence (r=-.26, p<.001). Interestingly, extending the results of Killingsworth and Gilbert (2010) probe caught mindwandering was also negatively correlated with activation (r=-.26, p<.001), providing a clear picture of the effect of mindwandering on core affect. Nevertheless, as there was in the study conducted by Killingsworth and Gilbert (2010), it is hard to infer the direction of causality from these results and thus more research on this topic is warranted.

Warm Attention. Tests of divergent validity uncovered an interesting relationship between measures of social attention and the stereotype content model. Whilst in an interview setting one might expect that

observers would pay more attention to candidates that they viewed to be competent, it was in fact perceptions of warmth that was more strongly correlated with measures of social attention. Results reported in table 3 show that warmth was correlated with seven of the measures of social attention whereas competence only correlated with four, further, of the measures that both correlated with, the relationship between warmth and attention was always stronger. To probe this relationship further, a simultaneous regression was run on the four measures of social attention that correlated with both competence and warmth, with both measures entered together. Results showed a consistent pattern. When entered simultaneously, general attentiveness was related to warmth (b=.31, p<.001) but not competence (b=.03, p=.646), selective attentiveness to candidate was related to warmth (b=.31, p<.001) but not competence (b=-.05, p=.328), probe caught mindwandering was related to warmth (b=.68, p<.001) but not competence (b=.15, p=.357), probe caught externalized attention was related to warmth (b=1.03, p<.001) but not competence (b=.19, p=.405). Overall, this provides evidence for the important role of warmth judgements in attracting social attention and somewhat surprisingly shows that this is more important than competence, even in a workplace setting.

Autism and Social Attention. Analyses were conducted to examine the effect of autism on social attention. Autism is a spectrum disorder characterized by pragmatic language use, social aloofness, and behavioural rigidity. Whilst it is a clinical diagnosis, scholars have also argued that we all fall somewhere on the autism spectrum and that has been designed to measures autistic traits in the general population. This scale, the broad autism phenotype (Hurley et al., 2007), was administered in study and using the cut-offs defined by Gerdts and Bernier (2011), and 40.8% (SD=.49) of the sample was found to meet the requirements to be considered on the broad autism phenotype.

Past research has linked autism with impairments in social processing (Adolphs et al., 2001; Baron-Cohen, 2000). However, this research has focused on individuals with clinical diagnoses of autism, so this study sought to replicate these results in the general population. Results found that individuals with autism paid reported lower level of generalized attention (r=-.20, p=.004) and higher levels of generalized inattention (r=.25, p<.001), intentional mindwandering (r=.21, p=.003) and unintentional mindwandering (r=.20, p=.004). Further, these individuals performed poorer on the memory test (r=-.16, p=.027). These results suggest that the autistic traits associated with the broad autism phenotype could play a large role in such individuals capacity to

function effectively in workplace environments, encouraging more work on the accessibility of work for these individuals (Waisman-Nitzan et al., 2021).

Longitudinal Analyses. The next set of analyses analysed longitudinal trends in attention using the thought probes. Figure 5 provides a summary of responses to each probe at different points across the VR vignette. Consistent with past literature on attention spans (Bradbury, 2016), as the experience went on, the incidence of mindwandering increased in participants (b=.003, se=.0007, p<.001). Next, I examined whether this relationship followed a quadratic function, this would be consistent with past literature of recency and primacy effect (Capitani et al., 1992), i.e., that individuals pay attention to information near the beginning and end of a sequence, however, this has not been demonstrated in realistic social environments. Results found support for a quadratic (inverted-U) function of attention, with mindwandering being lowest at the beginning and end of the vignette (b=.001, se=.0001, p<.001), this is displayed in Figure 5.

Discussion

This chapter set out to validate measures of social attention and provide a proof-of-concept study for VR vignettes. After defining and operationalizing social attention this chapter provided tools for future research on attention. A number of psychometric scales and thought probes were found to predict objective memory of social information, which were sufficiently distinct from related constructs (e.g., core affect), and were correlated with one another; see Table 3 for a summary. The use of virtual reality as a research tool was also able to replicate previously documented results in naturalistic settings (Killingsworth and Gilbert, 2010) along with providing new insights on existing phenomenon using longitudinal analyses. This helps set a platform for the study of social attention in realistic work environments. Below, I discuss the key takeaways and insights from this chapter.

Valid Measures of Social Attention

The primary focus of this chapter was to identify valid measures of social attention. A number of measures were identified, and further measures ruled out. The discussion of these measures is separated into the three different measurement tools: psychometric scales, thought probes, and eye tracking.

Use of Psychometric Scales. Psychometric scales provided valid measurement of social attention during the VR Vignette. Specifically, the measures of general attentiveness (Rothbard, 2001; originally termed attentional engagement), general inattentiveness (Kanfer et al., 1994; originally termed off-task thought), and mindwandering (intentional and unintentional subscales; Seli et al., 2012), all showed validity across the three criteria. Interestingly, intentional, and unintentional mindwandering did not show much variation suggesting both of these are equally important elements of social attention. The selective attention measures (e.g., selective attention to candidate and selective attention to interviewer) also showed validity across the three criteria, however, they did not show predictive validity beyond measures of general attentiveness and inattentiveness. This is potentially due to the nature of an interview as a social interaction with only one focal actor. Therefore, general attentiveness and attention to the candidate is likely have a high degree of overlap.

Based on these results, for simple social interactions with one focal actor, general attentiveness appears to be a stronger proxy for social attention than selective attentiveness. That said, in situations in which there are numerous social actors, selective measures might be more effective at picking up variation in attention. Thus, I do not rule out the use of selective attention in future research, but it would be the burden of future studies to demonstrate its use above and beyond general measures of attentiveness. Overall, the validity of using psychometrics as a measure of social attention is very promising as it provides an easy tool for measuring social attention in virtual reality and other natural environments.

An interesting observation from the tests of divergent validity is that generalized measures of attention were correlated with all measures of social perception (i.e., valence, activation warmth, competence, attractiveness), but general inattentiveness was only correlated with a subset (activation and warmth). This presents an interesting avenue for future research to explore the differences between attentiveness and inattentiveness. One potential explanation for these results could be that attentiveness is more closely related to one's cognitive control of attention and thus to social perceptions. In other words, if one perceives a social actor to be more attractive or feel more positive when listening to them, then one will choose to devote more attention to these social actors. Alternatively, inattention is often viewed as the

result of the unconscious process through which attention drifts from one's previous goals (Killingsworth & Gilbert, 2010; Smallwood & Schooler, 2015), making the process potentially more random and less intrinsically linked to individuals active perceptions of a social actor. Irrespective of the accuracy of this explanation, understanding whether attentiveness and inattentiveness have distinct antecedents could have important practical ramifications for how employees and organisations seek to maximize the efficiency of attention at work.

Use of Thought Probes. Results found that thought probes were also a valid measure of social attention. In particular, probe caught mindwandering showed validity across all three criteria and was the strongest predictor of memory out of any of the social attention measures. There was also evidence of a distinction between probe caught internalized and externalized attention. Internalized attention was a significant predictor of memory, correlated with general attentiveness, and not correlated with core affect, or social perceptions of warmth, competence, and attractiveness. Externalized attention on the other hand was not a predictor of memory but correlated with all psychometric measures of social attention along with affective valence and social perception measures. These distinctions could be in part due to the ipsative nature of this measure and thus warrants further research. However, a speculative hypothesis could be that internalized attention plays a critical role in forming memories and remaining engaged, alternatively, externalized attention is primarily gathering information but not storing it. Whilst this distinction is an intriguing avenue for future research, the clearest takeaway from the thought probe measure is that mindwandering, as a binary variable, is the strongest predictor of social attention in naturalistic environments, providing consistency with past work using this as a measure in applied attention research (Killingsworth & Gilbert, 2010; Robison et al., 2019; Seli et al., 2016). Further, the longitudinal insights that can be made using thought probe measures make it theoretically advantageous for a wide range of research questions.

Use of Eye Tracking. Despite being the gold-standard in cognitive science, eye tracking metrics were not found to significantly predict social attention. Specifically, the two metrics that failed the validity criteria

were i) time spent looking at the candidate, and ii) number of fixations to the candidate. Whilst this result is disappointing, as eye tracking could be a non-invasive process tracing measure of attention, future researchers should not be discouraged. First of all, the current results do not speak to the use of VR eye-tracking when measuring attention to visual stimuli (e.g., slides or non-verbal events) where this measure is still the gold-standard. Second, this result could be attributable to the nature of the interview context having only one focal social actor. This meant that there was little competition for attention and could have contributed to participants staring at (but not paying attention to) the job candidate as that was all there was to look at. Finally, and most importantly, the eye-tracking metrics used in this study were the low hanging fruit. Ongoing work is looking at how more complex combinations of metrics and machine learning models can predict attention (Brishtel et al., 2020; Klesel et al., 2020). In sum, whilst the current use of eye tracking was not successful there is reason to stay optimistic about the use of this as a measure of social attention.

Empirical and Theoretical Insights

This chapter also sought to demonstrate the validity of VR vignettes as a tool for examining social attention in realistic work environments. The identification of valid measures of social attention using this tool alone provides evidence that social attention can be meaningfully linked with memory, affect, and social perception, using VR vignettes. However, beyond the validity of this approach, I would also like to highlight a few of the empirical and theoretical insights that can be drawn from this study and inspire future research.

The data from this study underline the use of VR vignettes to replicate and extend past work on attention in naturalistic settings. The most cited field study on attention was conducted by Gilbert and Killingsworth (2010) which examined the incidence and effects of mindwandering in everyday life. This chapter had a similar focus but focused on one particular aspect of work life: conducting interviews. Despite the differences in methodology, this study was able to replicate the core finding from Gilbert and Killingsworth (2010), that the "wandering mind is an unhappy mind". In their study Gilbert and Killingsworth (2010) also estimate the incidence of mindwandering in everyday life to be 50%. This figure has had a huge effect on the field being reported in news outlets and papers in organisational science (e.g., Dane, 2018). This

chapter provides a new estimate on the incidence of mindwandering, which is considerably lower at 14%. Given the interest in the role of mindwandering at work (Baer et al., 2021; Dane, 2018), having a strong estimate incidence of this phenomenon at work (and across different domains of work) is critical in estimating the importance of this field of research. There are a variety of theoretical reasons why the estimate found in this study is considerably lower than that of Gilbert and Killingsworth (2010), most notably that in the current study participants had a salient goal, however, irrespective of this, VR vignettes provide a powerful tool for estimating mindwandering across a number of different workplace scenarios and ultimately provide a rich understanding of this phenomenon.

Another intriguing finding from this research is the important role of warmth in attracting social attention. The stereotype content model argues that warmth and competence are the two fundamental judgments through which we perceive others and considerable work has explored the importance of these two social judgments in the workplace and beyond (Cuddy et al., 2008, 2011; Fiske et al., 2007). However, research has not considered the role of these dimensions in capturing social attention; see Chapter 2 for an in-depth discussion of attention capture. Further, it might be logically expected that in an interview setting, where the goal is to determine whether a job candidate is suitable for a job, observers might pay more attention to candidates they perceive to be competent. However, results consistently showed that perceptions of warmth were a stronger predictor of social attention and that when both warmth and competence were entered into a model, only warmth predicted social attention. These "warm attention" results are reminiscent of Bogdan Wojciszke's work on the primacy of warmth/communion judgments over competence/agency (Abele & Wojciszke, 2007; Wojciszke & Abele, 2008). They also attract theoretical speculation as to why warmth is more effective at attracting attention. Whilst the current research is not well positioned to explore such theories it does provide a spark to such research endeavors. In particular, future research should aim to examine the role of warmth and competence in capturing social attention using an experimental method, in order to ascertain causality.

Another finding emerging from the exploratory analyses was the evidence of impaired social attention in individuals with autism. There have been recent calls for research to study how workplaces can be made more accessible for individuals with autism (Bury et al., 2021; Waisman-Nitzan et al., 2019, 2020, 2021). The results of this paper show that in a sample of students at a major Singapore university, roughly 40% met the cut off for having a broad autism phenotype. More critically, and consistent with past clinical research, these individuals did show greater challenges with social attention. This finding helps shed light on the challenges faced by autistic individuals in the workplace and encourages research on how such challenges can be tackled by employees and organisations. Theoretically, this finding also shows the important role that neurodiversity plays in the workplace and begs the question of how impairments in social attention could more broadly impact social functioning in the workplace, answering calls for research on this topic (Krzeminska et al., 2019; Sutherland, 2016; Walkowiak, 2021). Given these analyses were exploratory, the first step should be replication, if this is successful, studying autism could be a strong avenue for organisational. research on social attention.

The data from this study also shed light on a previously understudied topic, the longitudinal trends of social attention. By measuring attention using thought probes across the VR vignette, growth curve analyses could be conducted to understand the relationship between attention and time. These analyses found evidence for a quadratic, affectionally termed "boomerang", relationship between mindwandering and time, with individuals mindwandering the least at the beginning and end of the scenario and most in the middle. This pattern is consistent with research on primacy and recency effects (Capitani et al., 1992), however, it is important to note that these effects are primarily concerned with the memory of primary and recent information in learning tasks and have not explicitly linked this process with attention. Further, primacy and recency effects have predominantly been shown in abstract cognitive tasks (Capitani et al., 1992; Gupta, 2005; Jahnke, 1965), e.g., number strings. Therefore, there is little research on primacy and recency as an applied psychological phenomenon and thus the evidence for this in the social domain is a potential avenue for future research.

Beyond the contribution to research on recency and primacy effects, the inverted-U shaped relationship between time and attention could have more important ramification for applied research on social attention. Recalling the discussion in the literature review on contrasting views of attention as a "limited cognitive resource" vs. a "selective behaviour enacted by the brain", this result provides theoretical support for the latter interpretation. If attention were viewed as a limited resource, it would be expected that attention would wane over time in a linear (or potentially exponential) fashion. Therefore, the empirical result of this paper, that attention returned at the end of the interview to the level seen at the beginning is hard to explain from this perspective; it would seem that the resource of attention was miraculously restored at the end of the interview. However, this inverted-U shaped function is consistent with a behavioural account of attention in which attention is selectively allocated to an individual's most salient (incomplete) goals. Importantly, participants did not *know* when the scenario was going to end, they just received signals from the interviewer (e.g., "our final question is…"). Therefore, it is likely at the beginning of the interview the goal to pay attention to the candidate is extremely salient and that the salience of this goal wanes over time as other goals are activated. Further, it is also then likely that a reminder that the interview is ending makes the participants goal to pay attention salient again; I am sure we have all said to ourselves at the end of a long (boring) meeting "Geez, I better pay attention now, so I have something to say at the end". This goal becoming more salient could then explain the waxing of attention in the final period of the interview. In sum, these longitudinal analyses provide a rich insight into the dynamic nature of attention in realistic settings and potentially provide a critical test of the two predominant views of attention as a resource vs. behaviour. This chapter is by no means the final word on this topic, but it does provide a platform (or better yet springboard) for research on the longitudinal dynamics of attention which has critical theoretical and practical ramifications for organisations and applied psychology more generally.

Practical Insights on Conducting Research Using VR

Practically speaking, this research demonstrates that data collection on a large scale is feasible using VR Vignettes. Over three hundred participants were run in VR over roughly two weeks with six participants

being run every hour. The data collection was primarily carried out by the PI and a single research assistant; however, the experiment was also run by a single investigator on one of the days, indicating the relative ease of data collection. Concerning the health and safety of the participants, in stationary ~10 min VR vignette in which the participants could be seated, and the camera was not moving, no participants experienced high levels of simulation sickness requiring medical attention or even precautionary attention. Finally, technical difficulties did lead to a number of data points being lost. With eye tracking and thought probes these failures seemed largely unavoidable, though with sufficient time the solution to all technical problems encountered was restarting the VR headset and/or Laptop, with no problems lasting for longer than 1-hour session. Other data lost was due to experimental error – e.g., not keeping the laptop connected to a power source or wires getting tangled – whilst these may be unavoidable these events were rare.

Chapter Summary

This capture sought to address three questions:

- "What is social attention?" The answer provided is: a selective behaviour of the mind that varies over the period of a social interaction.

- "How do we measure social attention?" Empirical analyses identified numerous valid measures of social attention including psychometric measures (generalized attentiveness, generalized inattentiveness & mindwandering (intentional and unintentional) and thought probe measures (mindwandering & externalized attention)). Further, it was found that in the interview context, eye tracking metrices of gaze duration and number of fixations was not a valid measure of social attention.

- "Where do we measure social attention?" One answer this chapter provides is in virtual reality. This does not preclude the use of other naturalistic techniques of measuring social attention, but the experimental control afforded in virtual reality does make it an attractive option for scholars.

The answers to these questions have informed the following chapters in this dissertation, setting the much-needed groundwork for the theoretical and empirical exploration of social attention in organisations.

Nevertheless, this study also uncovered unexpected empirical insights that could ignite future research. Most notably these were the findings related to warm attention and the boomerang (inverted-U shaped) nature of social attention. The "warm attention" finding that perceptions of warmth predict social attention more than perceptions of competence, is a finding that currently has no theoretical explanation and is thus exciting avenue for future research on attention capture, discussed further in Chapter 2. The "boomerang (inverted-U shaped) social attention" finding, that attentiveness is highest at the beginning and end of a social interaction but wanes in the middle. It is also not predicted by existing models of social attention (partly due to the lack of such a model) and thus provides a good starting point for this work. More generally, the uncovering of these findings further underlines the need for research on social attention, as the current dearth of work in this area means there is a lot to be discovered.

In the following table, the key findings and takeaways from this chapter are summarized:

KEY FINDINGS & TAKEAWAYS

Validity of Social Attention Measures	Self-report and Thought probes were found to be valid measures of social attention correlating with objective measures of attention (criterion), each other (convergent), and being distinguishable from other social constructs (divergent). Eye Tracking metrics for gaze duration and number of fixations was not validated.
Warm Attention	Warmth is more strongly correlated with social attention than competence, suggesting this core social judgement are particularly important.
Less Mindwandering than Expected	Incidence of mindwandering in interviews was 14%, considerably lower than previous estimates of 50% mindwandering in daily life.
Boomerang (Inverted U-Shaped) Social Attention	Longitudinal analyses revealed an inverted U-shaped function of attention with mindwandering (focused attention) being lowest (highest) at the beginning and end but highest (lowest) in the middle. Suggesting that attention waxes and wanes during the interview process.
Autism Impairs Social Attention	Individuals with the broad autism phenotype (~40%) showed reduced levels of social attention and cue sampling. This has implications for the accessibility of the workplace for autistic individuals and neurodiversity more broadly.

CHAPTER 2
SOCIAL ATTENTION AND JUDGEMENT FORMATION

A key component to navigating the social world is forming social judgements about others (Fiske & Taylor, 2013; Ross & Nisbett, 2011). These social judgements can come in a variety of forms: trustworthiness, attractiveness, intelligence, etcetera. In the workplace, individuals' abilities to accurately make social judgements forms a key part of organisational success. For example, judging whether a negotiation partner is willing to cooperate, if a leader has good intentions for you, and whether other's behaviours are done out of malice or ignorance, are all antecedents to individuals' decision making and thus the success of the firm (Cyert & March, 1963; Simon, 1947). One particularly notable domain in which social judgements have an immediate impact on an organisation is in hiring. Organisations typically have a variety of routines that support an employee's ability to make accurate judgements during the hiring process (Ryan & Ployhart, 2014). However, what this chapter argues, is that irrespective of the amount or quality of the information provided, the first process in determining the accuracy of an employee's judgement of a job candidate is their ability to pay attention to the relevant social information being provided to them. Therefore, attention is valuable to an organisation as it helps ensure that the employees tasked with making key social judgements are paying attention to the relevant information.

However, attention is equally important to the job candidate seeking to be hired by an organisation. A job candidate's goal in the selection process is to receive a favorable judgement from others, i.e., influence others' decisions in their favor. Influencing others through capturing their attention has long been appreciated as a key antecedent to employee success within organisational settings (Cialdini, 1987; Cialdini & Goldstein, 2004). And this is seen across the animal kingdom, with everything from tropical birds mating dances to leaping springboks, being viewed as strategies to capture the other's attention in order to receive a favorable judgement (Kreps & Sobel, 1994). This battle for attention has been discussed in the management literature under theories related to issue selling (Dutton, 1997; Dutton & Ashford, 1993) and the ecological perspective of attention (Bouquet et al., 2009; Hilgartner & Bosk, 1988). However, these papers have focused on how "issues" can be sold based on how they are structured, how the information is framed, and the

medium through which information is presented (Ocasio, 2011). This chapter focuses more on micro socio-cognitive processes associated with selective attention, seeking to understand how organisational actors' social characteristics play in capturing social attention. This latter battle is one that is becoming more and more competitive with the multitude of technological devices vying for our attention (van Knippenberg et al., 2015).

Similar to the animal kingdom, humans also likely have methods for capturing other people's attention. These can include genetic or social factors. For example, research has found that individuals pay more attention to attractive than unattractive faces (Valuch et al., 2015). This is partly because features that people typically view as attractive, e.g., facial symmetry, are indicators that other individuals have good/healthy genes (Luxen & Van De Vijver, 2006). Equally, research has found that social cues associated with power and status can also capture other's attention (Giesbrecht et al., 2017), although interesting, the effect of power is only seen in men (Mason et al., 2010). These are just a few examples of factors that govern to what extent individuals capture other's attention, however, they are also both relatively inflexible factors being ascribed by either genetics or societal forces. This chapter explores an individual-level characteristic that could affect the extent to which individuals capture others attention and is to a large extent malleable within individuals: Charisma.

The chapter's theoretical development is structured in two sections. The first focuses on the generalized role of social attention in judgement formation. The second section then focuses on the role of charisma in capturing the other's attention and the downstream affects this has on social judgement formation. The naturalistic workplace environment studied in this chapter is a job interview, and the social judgement being formed is of a job candidate. However, the theoretical arguments presented can be extended beyond this context to any situation in which one social actor is forming a judgement about another social actor.

Social Attention and Judgment Formation

Judgement formation can be parsimoniously explained using the Lens Model (Brunswik, 1952). The Lens Model is a meta theory that states that individual's judgements are based on their utilization of relevant "cues" (i.e., information) in their environment along with the strength of the relationship between the cue and the criterion one is forming a judgment on. The lens model is represented in Figure 6. Within the context of a job interview, the cues that individuals are using to form judgements are the indicators of the candidate's knowledge, skills, abilities, and other attributes (KSAOs). However, individual's ability to notice these cues is limited by their inherent bounded cognitive capacities (Simon, 1991). Therefore, it is seemingly inevitable that individuals will fail to sample relevant cues when forming judgements. Within the Lens model, an unsampled cue cannot be utilized and thus must be weighted as "0", in an individual's judgement formation; see Figure 7. In other words, an unsampled cue in the lens model is equivalent to an unutilized cue[c]. The issue is that this process of cue sampling is not currently appreciated with the Lens Model framework (Karelaia & Hogarth, 2008). Therefore, within the current lens model parameters researchers cannot distinguish between an unutilized cue and an unsampled cue. Whilst this is practically manageable, as numerically these two phenomena can be treated the same, it is theoretically problematic. First, it is clear that the cognitive processes that lead to a cue being unutilized and the ones leading to a cue being unsampled are completely different, meaning they draw on different psychological mechanisms. Second, without appreciating the distinction between unsampled and unutilized cues it is challenging to predict decision makers future behaviour. This is because, whilst utilization of cues might remain relatively consistent over time, there is likely large variability in the sampling of cues. Ultimately this all contributes to "noise" in

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[c] Note, this refers to cues that are discrete/distinct pieces of information shared in the meeting. This is different to cues that are based on generalized perceptions of the social interaction (e.g., personality or emotion judgement) that could be estimated based on varying degrees of information. In such a situation inattention would have a similar effect as seen in Chapter 2, with reduced attention leading to reduced judgment differentiation/accuracy.

decision making, which is drawing increasing attention in the field (Kahneman et al., 2022). Therefore, a complete model of applied decision making needs to appreciate the role of cue sampling.

The relationship between cue sampling and judgement formation is not uniform and instead depends on the evaluation of the cue. In a job interview and many other scenarios, individuals form judgements on a bi-polar scale. On one side of the scale is the judgment that the candidate is high quality (i.e., should be hired) and on the other side of the scale is the judgment that the candidate is low quality (i.e., should not be hired). Every relevant cue (KSAO) that a candidate shares, influences an observer's judgement on where to place the candidate on this scale from high quality to low quality. For example, if the observer shares a cue that suggests they are high quality (e.g., they have above average writing skills) sampling this cue will positively affect the judgement they receive, equally, if a candidate shares a cue that indicates they are low quality (e.g., they have below average writing skills) sampling this cue will negatively affect the judgment they receive.

The consequence of this is that the judgement job candidates receive is the result of an interaction between the number of cues the interviewer samples *and* whether those cues are either indicators of the candidate being high quality or low quality. To simplify this, if we consider two candidates, one who is high-quality and the other who is low-quality, sampling more cues from a high-quality candidate will increase the positive judgment they receive. Alternatively, sampling more cues from a low-quality candidate will decrease the positive judgment they will receive. This is expressed in the following hypothesis:

Hypothesis 1: The relationship between candidate quality (high vs. low) and an observer's judgements will be moderated by the number of cues sampled by the observer such that as the number of cues sampled increases the difference between judgement of the high and low quality will increase.[d]

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[d] Note, this hypothesis was not registered in the dissertation proposal and was included as part of a refocusing of the dissertation to bring the discussion of cue sampling from Chapter 3 to Chapter 2.

This hypothesis has a broader implication for research on judgement formation. Much of judgement formation is subjective as each individual processes the information around them through their own perceptual lens. However, one aspect that is objectively important in the workplace and the world more generally, is the ability to differentiate between good and bad. For example, if a hiring committee is presented with a series of candidates that have all been rated as a seven on a scale of one to ten, then this seriously hampers their ability to make a decision and move forward. Therefore, a further implication embedded in this hypothesis is that as individuals sample more information from their environment when forming judgments their *judgement differentiation*, i.e., distinction between good and bad, will increase. Note, this doesn't mean the judgement is necessarily better, which is likely hard to objectively qualify and dependent on the cues that are sampled being valid indicated, but just more distinct from one another. This process of judgement differentiation is particularly important in selection, given that the ultimate decision is binary – hire or don't hire – so the difference between participants is more important than the absolute number.

The importance of social attention in judgement formation also underlines the value of attention for organisational success. Employees who are attentive help the organisation perform better (Reb & Atkins, 2015; Rothbard & Patil, 2011). Moreover, with the growing demands put on employee's attention from endless number of devices vying for attention, variety of information sources available from data analytics, and the increasing incidence of remote work, the importance of attention is only increasing in the modern workplace (van Knippenberg et al., 2015). However, this isn't just because attentive employees are more productive, engaged, and motivated as the majority of existing research focuses on (Kanfer & Ackerman, 1989; Leroy & Schmidt, 2016; Rothbard, 2001) but also because these individuals are able to *select* key information from their environment in order to form better judgements which can then inform behaviour. In sum, attention is valuable to organisations from the "supply side", e.g., the extent to which employees can

supply attention in the selection process. The next section views this same process from the "demand side" and the potential value of capturing an audience's attention for job candidates.

Attention Capture and Charisma

The process of attention capture has been studied extensively in the cognitive sciences. This has predominately been in the domain of vision, for example, colors, movement, and novelty capture attention (Abrams & Christ, 2003; Allport, 1989; Davoli et al., 2007; Desimone & Duncan, 1995; Hillstrom & Yantis, 1994; Theeuwes & Van der Stigchel, 2006; Turatto & Galfano, 2000). Similar research has been conducted using social stimuli such as faces (Theeuwes & Van der Stigchel, 2006; Valuch et al., 2015) or video clips (Birmingham & Kingstone, 2009; Laidlaw et al., 2011). In general, the process of attention capture can follow one of two routes (Buschman & Miller, 2007; Parr & Friston, 2019; Posner & Petersen, 1990). The first is through the goal-directed "top-down" control of attention, in which individuals consciously direct attention toward information that will aid (one of their many) goal pursuits. The second is by arising from monitoring of one's external environment leading to a "bottom-up" shift of attention, in which individuals are drawn to salient novel information in their environment. As mentioned in the literature review, this shifting of attention is likely due to evolutionary chronic goals (e.g., to avoid danger) but has become hard-wired in the attention system. When considering social attention in naturalistic work environments the same processes are at play and social (organisational) actors who are able to encourage their audience to consciously direct their attention to them (i.e., top-down) and/or make themselves salient relative to the background environment (i.e., bottom-up) are those individuals who will capture other's attention and thus have greater influence (see Figure 8 for a representation of the attention capture process). This section develops theory on why charisma might, in part, function as a tool to capture other's attention.

Charisma is defined as the value-based, symbolic, and emotion laden signaling of information (Antonakis et al., 2016). Past research on charisma has focused on how charismatic leaders are able to inspire (i.e., influence) their subordinates and ultimately improve follower performance. The majority of research on charisma in organisations has focused on leadership and its importance in the transformational leadership

construct (Steyrer, 1998). However, this paper views charisma from a cognitive science perspective, examining how the communication characteristics of charismatic individuals operate to capture other's attention. This builds on recent charisma scholars' work in clearly identifying behavioural cues associated with charisma and providing an operational definition of charisma as a signaling device (Antonakis et al., 2016), in order to examine whether a core mechanism through which charisma allows individuals (not just leaders) to capture others' attention and thus influence them. Charisma is an ideal initial attention capture device to examine because it has been described through discrete behaviours, meaning they can be taught to individuals, but these behaviours only have meaning in social situations (i.e., when perceived by others) inherently tying them to the social context.

Charisma is associated with both verbal and non-verbal social cues. These cues have been discussed across a series of articles and largely find consensus in the primary behaviours (Antonakis et al., 2011; Awamleh & Gardner, 1999; Kirkpatrick & Locke, 1996). Verbal cues refer to differences in the content shared by charismatic vs. uncharismatic individuals, whereas non-verbal cues refer to the differences in delivery of this content. Verbal cues include using metaphor, telling stories and anecdotes, asking rhetorical questions, etcetera (Antonakis et al., 2011; Awamleh & Gardner, 1999; Kirkpatrick & Locke, 1996). These verbal cues increase the symbolic and value-based nature of the communication by charismatic individuals, however, incorporating these features into speech requires individuals to adapt the information they are sharing and potentially embellish information. Alternatively, non-verbal cues of charisma are clear behavioural actions (e.g., eye contact, hand gestures) that can easily be incorporated into one's presentation of information (Antonakis et al., 2011; Awamleh & Gardner, 1999; Kirkpatrick & Locke, 1996). Maintaining the consistency of the information shared is critical to research on attention because *information* is the central construct that is being attended to. Therefore, in order to examine how charisma impacts social attention *without* changing the information shared, this paper focuses on the non-verbal cues of charisma. Further, it is worth noting that research has found that the use of verbal cues and non-verbal cues of charisma is significantly

correlated, suggesting (consistent with theory) that these two processes draw from the same underlying theoretical construct (Antonakis et al., 2016).

To examine how non-verbal charisma cues could increase the extent to which speakers capture their audience's attention, this chapter discusses each distinct cue in turn. The first non-verbal cue associated with charisma is body movement and hand gestures for emphasis. Hand and body movements are termed co-speech gestures and are natural for most speakers, although they do vary across cultures (Clough & Duff, 2020; Feyereisen & De Lannoy, 1991). The use of these gestures has been studied extensively in psycholinguistics, however, through the lens of social attention we can consider additional purposes of these gestures. First, using gestures and movements can be an additional way of communicating information (Goldin-Meadow et al., 1993). Therefore, an audience with a goal to pay attention (i.e., listen to what the speaker is saying now) has additional visual sensory information to accompany the verbal information. By providing the listener with additional sources of information, charismatic individuals can make the listener's goal to listen more prominent and reduce the likelihood that attention would be directed to a different incomplete goal. Second, by using frequent gestures and movement, charismatic individuals are increasing the unpredictability in the surrounding environment. Similar to how our attention is drawn to fast moving objects and objects changing in speeds in our local environment (Abrams & Christ, 2003; Hillstrom & Yantis, 1994), an individual who is more dynamic, speedy, and unpredictable in their movements is likely to attract more attention through individual's bottom-up monitoring of their environment. Another related non-verbal charisma cue that might use this latter mechanism to attract attention is using a varied vocal tone, similar to body movements, variation in tone could draw bottom-up attention by appearing less predictable and thus more important to monitor. Together, charismatic individuals can use hand movements and a varied vocal tone to: a) increase the prominence of the audience's goal to listen by communicating through an addition visual medium (co-speech gestures) and b) present information in a more dynamic (i.e., less predictable) format to increase the likelihood that the audience will continue to monitor the speaker.

A second non-verbal charisma cue is eye contact. Eye contact is a powerful interpersonal interaction and has significance across the animal kingdom (Senju & Johnson, 2009; Thomsen, 1974). Within communication, eye contract is an important signal of attentiveness (Freeth et al., 2013). Research has found that when others are speaking individuals typically look toward the speaker roughly 70% of the time (Dawson & Foulsham, 2021). The significance of when a speaker makes eye contact with their audience is that now the speaker and the listener have a 'shared attention' to one another. Shetynberg (2015) has extensively studied the phenomenon of shared attention – when two individuals are co-attending to something – and found that it increases individuals' cognitive and affective engagement with their task. Considering social attention, it thus follows that by making eye contact with the audience, charismatic individuals are able to create a shared attention with the audience and thus increase the audience's cognitive engagement with their goal of listening. In addition, consistent with social exchange theory (Cropanzano & Mitchell, 2005), the reciprocal nature of eye contact may place an expectation on the audience to listen to the speaker's information. In sum, charismatic individuals can use eye contact to create a sense of shared attention and generate an obligation of reciprocation from their audience, and thus increase the prominence of the audience's goal to listen.

A third set of non-verbal charisma cues is the use of animated facial features and pauses for emphasis in speech. Both these processes are important in conveying the emotion and value of the speaker. Emotional expressions, particularly facial, play an important interpersonal function in society (Barrett, 2017; Schwarz, 2012). Facial expressions such as smiling, or frowning are methods for signaling to others one's internal state but more generally they are methods for conveying meaning (Rychlowska et al., 2017). When paying attention to social actors (also referred to more specifically as "organisational actors"; Ocasio, 2011), the primary goal of individual is to derive meaning from their statements, by indicating sections that have meaning (thought animated facial expressions and pauses) charismatic individuals could draw more attention to these critical statements. More generally, by varying the vocal tone and space of speech, charismatic individuals can speak in a less predictable pattern, drawing more bottom-up attention from their audience.

Therefore, charismatic individuals can use animated facial features and pauses to: a) increase the prominence of the audience's goal to listen by making the statements appear more meaningful and b) make the prosody of their speech less predictable and thus more important for the audience to monitor.

To summarize, charismatic individuals are theorized to capture attention through a variety of theoretical processes. These include processes that make the audience's goals of listening more salient (e.g., eye contact), the information richer (e.g., co-speech gestures), and drawing attention to the key information in sentences more successful (e.g., facial expressions/pauses). Each of these processes work by increasing the audiences 'top-down' motivation to pay attention. Alternatively, charismatic individuals are also theorized to capture attention through speaking in a less predictable pattern, with more dynamic movement, in order to also attract bottom-up attention from their environment as audiences constantly update their model of the outside world. To use an analogy, similar to how a color television attracts more attention from viewers than a black and white one, non-verbal charisma cues add richness to the information being shared without changing the information. The breadth of cue associated with charisma, and the research on this trait in other fields, makes it a rich theoretical starting point for examining mechanisms through which individuals capture other's attention

Hypothesis 2: Charismatic individuals capture more social attention from an audience than non-charismatic individuals.

According to the processes described above, charisma increases social attention by constantly using techniques to return their audience's focus to the charismatic individual. For example, if an interviewer's attention has strayed to other incomplete goals, then a quick hand gesture, a change in vocal tone, a dramatic pause, and so on, is theorized to break the interviewer's period of mindwandering and return attention to the candidate. Linking this with research on meta-awareness - the awareness of one's awareness/attention (Schooler et al., 2011) – charisma is operating by more frequently bringing to the

interviewer's attention that their mind has wandered (if it has). As such, if we view a social interaction as a longitudinal process with interviewers constantly coming in and out of paying attention, the prediction would be that over time the attention directed to a charismatic individual stays more stable (i.e., less mindwandering). Building on the findings from Chapter 1, that social attention follows an inverted U-shaped function, it would be expected that the extent of this curve is less pronounced when individuals are attending to more charismatic individuals. This longitudinal hypothesis is expressed as follows:

> **Hypothesis 3:** The inverted U-shaped relationship between mindwandering and time during a social interaction (interview) will be moderated by charisma, such that as charisma increases the inverted U-shaped curve will be less parabolic (i.e., flatter).[e]

Charisma and Social Judgement Formation

By altering the extent to which individuals capture their audience's attention, it is also theorized that charisma will affect social judgement formation. As mentioned previously, the relationship between cue sampling and judgement is dependent on the evaluation made of the information being shared, such that for a high-quality candidate more attention will increase the positive judgement but for a low-quality candidate more attention will not decrease their positive judgement. Based on this, and the previous hypotheses about charisma increasing social attention, it follows that the effect of charisma on judgment formation will depend partly on whether the candidate is high quality or low quality, with high-quality candidates benefiting from charisma relatively more than low-quality candidates.

This hypothesis would be based purely on an attentional account of charisma. However, there is also considerable evidence that charisma is viewed as a positive trait itself (Bono & Ilies, 2006; Friedman et al.,

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[e] This hypothesis was not registered in the dissertation proposal as it was in response to the findings of Chapter 1, i.e., the inverted U-shaped relationship between mindwandering and time.

1988; Jacquart & Antonakis, 2015; Tskhay et al., 2017). This judgement account of charisma would posit that charisma is a signal of quality itself and thus individuals who are more charismatic will be judged more positively than individuals who are viewed as non-charismatic. As such, the two accounts – judgement account vs. attention account – arrive at different predictions of how charisma will affect judgements. First, the attention account predicts that high charisma individuals who are high quality will receive more positive judgments *but* high charisma individuals who are low quality will receive more negative judgments. Second, the judgment account predicts that high charisma individuals who are high quality *and* those who are low-quality will receive more positive judgments. However, there is also a complementary account that appreciates that charisma could operate through both these mechanisms. This combined (judgement & attention) account would predict that high charisma individuals who are high quality will receive more positive judgments *but* for high charisma individuals who are low quality the increased attention to their low KSAOs will cancel out their increased positive judgment due to charisma being a desirable trait. Ultimately, this will produce a null (or weakly positive/negative) relationship between charisma and judgement for these individuals. These contrasting accounts are formally stated below:

> **Hypothesis 4a (*Attention Account*):** The relationship between quality and judgement will be moderated by charisma, such that for high-quality individuals the relationship will be positive but for low-quality individuals the relationship will be negative.

> **Hypothesis 4b (*Judgment Account*):** The relationship between quality and judgement will *not* be moderated by charisma, such that for high-quality and low-quality individuals the relationship will be positive.

> **Hypothesis 4c (*Combined Account*):** The relationship between quality and judgement will be moderated by charisma, such that for high-quality individuals the relationship will be positive but for low quality individuals the relationship will significantly weaker (either null, weakly negative, or weakly positive).

Method

       This study investigated the causal effect of charisma on social attention and the judgements of job candidates. To do so the same VR vignette created in Chapter 1 was adapted into a between-subject experimental design using the same actor but manipulating charisma (charismatic vs. non-charismatic) and candidate quality (high vs. low) using different scripts: scripts for the scenarios are available at the OSF page (see VR Vignette Script). Vignettes were viewed using the Vive Pro Eye which has built in eye tracking hardware.

Participants

       A total of 318 participants were recruited, allocated across four experimental conditions, through the university subject pool in return for credit. Technical difficulties with the VR (e.g., video lagging due to computer being low on battery) led to 13 participants being excluded from analyses. The final sample was thus 305 participants of which 60% were female and the average age was 21.17 years old (SD = 1.51). Note, this is the same dataset used in Study 1.

       Participant Safety. All participants completed a scale measuring simulation sickness before starting the VR vignette and were told they could leave exit VR at any point by taking off their headset; note, no participants reported simulation sickness to the extent that they couldn't take part in the study (Stanney & Kennedy, 2010). Participants then completed the same scale immediately after completing the VR again with no participants reporting major adverse effects.

Procedure

       This study used a 2 (charismatic vs. non-charismatic) x 2 (low quality vs. high quality) between-subjects design, randomly assigning individuals to one of the four experimental conditions. After being assigned to their condition, participants viewed a VR vignette of a job interview; the vignettes varied in length from 11 to 14 minutes. This interview simulated a structured interview with a job candidate, an interviewer, and the participant playing the role of an additional interviewer.

During the VR Vignette, participants were probed to report where their attention was in a specific moment, with a screen appearing and with three response options (see measures section). Participants responded using a keyboard, with the keys '1', '2', '3', corresponding to the different response options. Before starting the vignette, the participant was given a verbal instruction on how to answer the thought probed measures and any questions the participants had were answered.

Participants' gaze direction was tracked during the interview using the Vive Pro Eye's built in eye tracking hardware. Before starting the VR vignette, each participant completed an eye calibration exercise run through the computer program Steam VR. Note, this was not used in analyses given that total time spent looking at the participant nor number of fixations to the candidate were valid measures of social attention (see Chapter 1). After the interview, participants completed all survey measures, including psychometric measures of general attentiveness.

VR Vignette

For a detailed description of the VR vignette used and the process for developing this scenario see Chapter 1. The two manipulations used in this study are described below.

Candidate Quality Manipulation. Two versions of the interview script were created for this study. In both scripts the questions from the interviewer were the same but the response of the candidate differed. The high-quality candidate's responses demonstrated higher quality knowledge, skills, abilities, and other attributes (KSAOs) than the low-quality candidate. For example, whereas the high-quality candidate was "generally in the top 25% of their class at university", the low-quality candidate was "generally in the top 50% of their class". As another example relating to the candidate's skills, the high-quality candidate reported that they were "good with Excel and can use a lot of the more complex functions" the low-quality candidate reported that they were "not very good with Excel". In addition to the objective differences between the candidates, the low-quality candidate also used more stutters (e.g. 'um' and 'er') when talking. Both scripts were sent to professors and industry experts who blindly assessed

the quality of the two candidates (high vs. low), with unanimous agreement on which of the candidates was high quality and which was low quality. The scripts are available at the OSF page.

Charisma Manipulation. Charisma was manipulated through non-verbal cues used previously in the literature (Antonakis et al., 2011; Awamleh & Gardner, 1999; Kirkpatrick & Locke, 1996). Specifically, in the charismatic condition, the actor playing the candidate was instructed to a) alternate between leaning forward in the chair and sitting back, whilst always sitting up straight, b) make frequent eye contact with the participant (by looking at the camera), c) use hand gestures while speaking, d) display animated facial features whilst speaking, e) use a varied vocal tone, and f) use pauses for emphasis. Alternatively, in the non-charismatic condition the actor was instructed to a) sit relaxed in the chair with minimal body movement, b) make limited eye contact, c) rest their hands stationary in their lap, d) speak in a monotone (but polite) voice, and e) use a constant medium paced tone.

Actors for VR Vignette

The actors used in this study were both professionally trained at a leading theatre school in the United Kingdom. Both actors were white, aged between 30-35, and from the United Kingdom (England). The interviewer wore a white shirt, the candidate wore a suit, and were both seated in the same position for all scenarios.

Measures

General Inattentiveness. The same 6-item scale measuring off-task thought developed by Kanfer et al. (1994) used in Chapter 1, α = .72.

General Attentiveness. The same 4-item scale measuring attentional engagement developed by Rothbard (2001) used in Chapter 1, α = .95.

Mindwandering (Intentional). The same 4-item scale developed by Seli et al. (2016) used in Chapter 1, α=.77.

Mindwandering (Unintentional). The same 4-item scale developed by Seli et al. (2016) used in Chapter 1, α=.85.

Thought Probes. Thought probes measured selective attention throughout the VR Vignette, see Chapter 1.

Cue Sampling (Memory). To measure which cues from the interview participants sampled, participant's memory of the VR vignette was tested. Correct answers for this test were scored as 1, incorrect answers were scored as 0. For a similar approach see Mason et al. (2010). There was a total of 11 questions (see appendix) with a maximum score of 15 possible.

Charisma*.* A 6-item scale developed by Tskhay et al. (2018) was used to measure perceptions of candidate charisma. Sample items are: "Had a presence in a room," and "Smiles at people often". Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree"): alpha = 89.

Candidate Evaluation. Participant's overall quality was measured using the following question: "Would you hire this candidate?". Response options ranged from: 1 "I would never hire this person," to 10 "I would certainly hire this person," (Fiechter et al., 2018).

Results

Descriptive statistics and correlations are provided in table 5. Note, given the data is the same sample as chapter 1, further information of correlations are provided in tables 2-4

Manipulation Check

To ensure that the experimental conditions successfully manipulated charisma and quality, we conducted two manipulation checks. The first comparison collapsed across the two charisma conditions (high vs. low) and found that in the high charisma condition (M=4.93, SD=1.01) perceptions of candidate charisma was greater than those in the low charisma condition (M=3.60, SD=1.08; t(303)=11.09, p<.001). Similar analyses where then conducted collapsing across the quality condition (high vs. low) and found that in the high quality condition (M=6.42, SD=1.98) perceptions of candidate quality was greater than those in the low

quality condition (M=5.00, SD=2.17; t(302)=5.94, p<.001). In sum, both experimental conditions successfully manipulated charisma and quality respectively.

Social Attention and Judgment Formation

To examine the relationship between candidate quality, perceptions of candidate quality, and cue-sampling, we used OLS regression. The predictor variables were a dummy variable equal to 1 for individuals assigned to a high-quality candidate and 0 for individuals assigned to a low-quality candidate, a variable indicating the number of cues the participant correctly sampled (i.e., memory), and the interaction term between these two predictors. The interaction predictor variable tested Hypothesis 1. The dependent variable was the measure of perceived candidate quality.

Results from regression analyses found support for the hypothesis, with the interaction between candidate quality and participant memory being significant (b=.22, SE=.11, p=.037). Figure 9 graphically represents this interaction showing that in the high-quality condition memory was positively related to ratings (b=.09, SE=.07, p=.169) and negatively in the low-quality condition (b=-.13, SE=.08, p=.119); note, whilst the simple slopes are not significant it is the interaction term that tests Hypothesis 1.

Charisma and Social Attention Capture

Next, the relationship between charisma and social attention was examined. For each analysis, the predictor variables were a dummy variable equal to 1 for individuals assigned to a high-charisma candidate and 0 for individuals assigned to a low- charisma candidate. The dependent variable was then each of the measures of social attention validated in Chapter 1. Starting with the psychometric scales, charisma was found to increase participants general attentiveness (M=5.43, SD=1.12, *charisma condition*; M=5.16, SD=1.12, *non-charisma condition*; t(303)=-2.13, p=.034) and reduce general inattentiveness (M=3.93, SD=1.21, *charisma*; M=4.21, SD=1.01, *non-charisma*; t(303)=2.15, p=.032). Analyses of the mindwandering sub-scales (intentional vs. unintentional) found there was a significant decrease in unintentional mindwandering (M=3.78, SD=1.51, *charisma condition*; M=4.23, SD=1.31, *non-charisma condition*, t(303)=2.15, p=.033), but

not for intentional mindwandering (t(303)=1.10, p=.273). In sum, there was consistent evidence across the psychometric scales for charisma increasing social attention (Hypothesis 2)

Next, the same hypothesis was examined using data from the thought probes. Given the ipsative nature of the measure the dependent variable was a binary variable indicating mindwandering (1) or not (0). Results found that incidence of probe caught mindwandering was significantly lower in the charisma condition (M=2.40, SD=2.08) than the non-charisma condition (M=3.86, SD=2.81; t(226)=-4.46, p<.001)[f]. This finding replicated support for Hypothesis 2.

Finally, the longitudinal trends of mindwandering were examined in the charisma vs. non-charisma conditions. Analyses regressed probe caught mindwandering on the interaction between the quadratic term for time and the dummy variable indicating condition. The three-way interaction predictor variable tested Hypothesis 3. Results found a significant two-way interaction between time (quadratic) and charisma (b=.001, SE=.000, p=.001)[g]. This relationship is plotted in Figure 10 and shows that the parabolic relationship between mindwandering and time is decreased in the charisma condition. This provides support for Hypothesis 3.

Charisma and Social Judgement Formation

Next, the contrasting hypotheses for the relationship between charisma and perceived candidate quality were examined. The predictor variables were a dummy variable equal to 1 for individuals assigned to a high-quality candidate and 0 for individuals assigned to a low-quality candidate, dummy variable equal to 1

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[f] Note, analyses focus on mindwandering given this measure performed best on the validation tests in Study 1 and the other measures are somewhat dependent on the incidence of mindwandering. Nevertheless, reports for externalized and internalized attention are reported here. A similar result was seen for externalized attention (theoretical inverse of mindwandering), with individuals in the charisma condition reporting more attention to the candidate (M=12.97, SD=3.85) than those in the non-charisma condition (M=11.29, SD=3.60; t(226)=3.42, p<.001). There was no difference in internalized attention across the conditions (t(226)=0.47, p=.642).

[g] To clarify, this two-way interaction is between time (quadratic) and condition (charisma). Therefore, the quadratic nature of time means the interaction term itself had three variable interacting. This is modelled as follows: b(time) + b(condition) + *b((time*time)*condition)* + error.

if individuals were assigned to the interview with the charisma condition and 0 if they were assigned to interview with the non-charisma condition, and their interaction. The interaction predictor variable tested Hypothesis 4(a/b/c). The dependent variable was the rating of candidate quality. Results found a significant interaction between candidate quality and charisma (b=1.03, SE=.45, p=.022), lending support consistent with hypothesis 4a (attention account) *or* 4c (combined account); in other words, this interaction is only inconsistent with a fully judgement account in which charisma directly affects social perception of the job candidate. Post-hoc analyses of the simple slopes reveal evidence in favor of Hypothesis 4c, with the effect of charisma and candidate rating being strongly positive in the high-quality condition (b=1.90, SE=.28, p<.001) only weakly positive low-quality condition (b=.88, SE=.35, p=.013).

Viewing this phenomenon from the supply side, i.e., the benefit to organisations of interview candidates being attended to more closely, analyses assessed the degree of judgement differentiation between the high- and low-quality candidates in either the charisma or non-charisma condition. The difference in ratings in the charisma condition between the high- and low-quality candidates were twice the size (M=7.38, SD=1.57, *high-quality condition*; M=5.43, SD=2.24, *low-quality condition*, t(303)=6.20, p<.001) of the difference between candidates in the non-charisma condition (M=5.47, SD=1.88, *high-quality condition*; M=4.55, SD=2.03, *low-quality condition*, t(303)=2.90, p=.004). In other words, judgement differentiation between job candidates increased when the candidates were charismatic.

Discussion

Social judgement formation is one of the most critical phenomena in organisations. This chapter investigated the role of social attention in judgement both from the demand-side (e.g., job candidate seeking to capture attention) and supply-side (e.g., organisations seeking to use attention to differentiate candidate quality).

From the demand-side, it was found that charisma increased social attention on all valid metrics except intentional mindwandering, with longitudinal analyses showing that charismatic individuals sustained their audience's attention during the middle of the social interaction when attention typically wanes (see

"boomerang social attention" results from Chapter 1). Further, in support of a combined (judgement and attention account) account of charisma it was found that whilst charisma did directly improve candidate judgement (consistent with a judgement account) this effect was moderated by candidates underlying quality (consistent with an attention account). In sum, non-verbal charismatic cues were found to capture social attention but the benefits of this for job candidates varied based on their underlying KSAOs.

From the supply side, results showed that memory of job candidate information (i.e., KSAOs) increased judgement differentiation between low-quality and high-quality candidates, indicating the important role of cue sampling in judgement formation. Further, relevant to organisations, candidate charisma also increased judgement differentiation, suggesting that job candidate charisma is helpful for organisations as it keeps selectors engaged. In sum, the results demonstrate the value of social attention in recruitment and to organisations more broadly.

These findings make theoretical and practical contributions to research on the lens model, social influence, charisma, and signaling theory, along with advancing the social attention research program promoted by this dissertation. Further, and of particular importance, this chapter provides a platform for future research on social attention. These contributions and future directions are discussed below.

Extending the Lens Model

This chapter demonstrated the critical role of cue sampling in judgement formation. In doing so, this paper makes contributions to research on the Lens Model. Currently, the Lens model focuses on two processes, cue utilization (an individual's weighting of a cue) and cue validity (association between a cue and the criterion). However, drawing on a central tenant of this dissertation, before a cue can be utilized in judgement formation it must be sampled, i.e., *attended to*. The results reported above in support of Hypothesis 1 show that if less of the candidate's cues a sampled then the judgements of candidate become milder, i.e., good candidates are seen as less good and bad candidates are seen as less bad, and thus differentiation between good and bad candidates becomes less clear cut.

This cue sampling parameter can be integrated into the lens model by mathematically factoring into the model the possibility that a cue is missed and is an interesting area for future research. Integrating this idea with work on attention capture, models could calculate with likelihood that a cue will be sampled – e.g., based on how charismatic the speaker is – and then incorporate this into the model to predict future decision making. Doing so would provide a more complete account of applied decision making and also help describe noise in judgement and decision making (Kahneman et al., 2022).

Moreover, this finding has broader implication for organisational and behavioural science, the judgements we form are constrained by the information we pay attention to and if we don't pay attention at all our ability to form clear judgments deteriorates. For a more in-depth discussion of the relationship between social attention and the lens model see Chapter 3.

Charisma as a Social Attention Capture Device

A second contribution of this chapter is that is provides evidence for charisma operating as a (social) attention capture device. Triangulating across thought probes and a variety of different psychometric measures, results consistently pointed to charismatic individuals receiving increased social attention, even when sharing the same information. This has implications for theories and research on social influence as it naturally follows that those who are attended to more will have more influence (Cialdini & Goldstein, 2004). Further, whilst it is intuitive that charismatic individuals might receive more attention it is not necessarily rational in a strict economic sense. Within the rational theory of choice there is a normative assumption that all information should be treated equally irrespective of its framing/presentation (Tversky & Kahneman, 1985). However, in the current study individuals are choosing (consciously or unconsciously) to attend to information presented charismatically more than the same information presented non-charismatically, this falls prey to the same "irrational bias" as the framing effect studied extensively in behavioural economics (De Martino et al., 2006; Tversky & Kahneman, 1985). The experimental design also showed how easy it is for someone to "increase" their charisma by simply adjusting non-verbal cues. For an in-depth discussion of the

theoretical implications of this bias refer to the "general discussion" at the end of this dissertation and the section on "socially bounded rationality".

Building on this contribution, this chapter also advances an attention-based account of charisma. Previous research on charisma has focused on how charismatic individuals are perceived to be more capable and warmer than other individuals and thus are able to inspire others (Cuddy et al., 2011). This judgement-based account has primarily argued for the positives of being charismatic with most findings suggesting it improves individual-level outcomes for leaders (Bono & Ilies, 2006; Friedman et al., 1988; Tskhay et al., 2017). Importantly, these two accounts are not mutually exclusive, however, they do differ on a number of key theoretical factors. For example, the attention account is primarily cognitive in nature unlike the judgement account, which is primarily based on social psychology, i.e., how we perceive others. As a result, the attention account does not specify whether charisma is a good or bad trait and in fact, building on hypothesis 1, one could argue that the benefits of being charismatic depend on whether the information you are sharing reflects positively on the you (or what you are presenting) or negatively. This leads to the most striking finding in this study, that the effects of charisma on other's social judgements is moderated by the underlying quality of the information one is sharing. Specifically, whilst for high quality candidates' charisma has a large positive effect on perceptions of candidate quality, for low quality candidates the positive effect of charisma is much lower. Given the effect is still positive, this is still consistent with a judgment account, however, the significant interaction is consistent with the attention-account, hence the conclusion that both of these processes are occurring in tandem. Importantly, contributing to the charisma literature, this shows the potential dark sides of being charismatic, as one could draw excessive attention to information that reflects poorly on themselves and instead individuals could be better off "going under the radar". This could contribute to why charismatic CEOs such as Elizabeth Holmes and Elon Musk might receive more negative media attention and condemnation of their companies than less charismatic CEOs (e.g., Tony Hayward or Sundar Pichai) whose companies also have committed acts of corporate social irresponsibility.

Signaling to Win the Battle of Attention

Another notable theoretical contribution of this paper is to Signaling theory (Spence, 1973). Signaling theory comes from research in economics and behavioural ecology and describes the process through which two individuals with conflicting goals communicate and decipher honest signals (i.e., cues/information). The theory has been used extensively in the selection literature, however, primarily in a watered-down form in which the theory is erroneously presented as the process by which individuals present signals for others (Bangerter et al., 2012). Addressing this, a recent conceptual piece by Bangerter et al. (2012) restate the core concepts of signaling theory and highlight (in the domain of selection) the ongoing battle between job candidates, who want to appear as good as possible by presenting the best possible signals, and organisations, who want to make sure that the signals being shared are "honest signals" (Spence, 1973). This chapter builds on this "battle" by showing it is not just being "waged" over the honesty of signals but also the attention to (i.e., sampling of) signals.

This contribution to signaling theory underlines a more general theoretical proposition emerging from this paper: the "battle for attention" within organisations. Social attention is valuable in employees as it facilitates their ability to exert influence on an organisation whether that is in search of a promotion, a sale, or in order to get hired (Cialdini & Goldstein, 2004). However, the bounded nature of human cognition means that individuals are only able to attend to one, or near to one, stream of information at any given time (Simon, 1955, 1957). So, who/what do they select to pay attention to? This selective nature of attention discussed extensively in this dissertation leads to the *battle for attention* within in organisations, where social actors are competing to have their voice heard and information acted upon. The chapter, as a whole, develops our understanding of how individuals can engage with this battle through charisma with variable benefits. The chapter also develops our understanding of the underlying battle between job candidates, who want to attract attention to their best signals and away from their worst signals, and finally our understanding of organisations, who want to gather all the available signals. This paper is only an initial foray into this topic and future scholarship can enrich the psychological and sociological understanding of this "battle for attention". One particularly interesting direction for this research is how this micro-level process can inform

macro-level theories of the role of attention in organisations (Ocasio, 1997); this is discussed in the Conclusion of this dissertation.

Practical Implications

The theoretical contributions describe above lead to a variety of practical implications for individuals within organisations. The primary practical contributions can be separated into two categories. First, those relevant for the individuals receiving a judgement from others (e.g., job candidates, entrepreneurs looking for startup funds, employees sharing ideas, etc.), i.e., the demand side of attention. Second, those relevant for the individuals forming a judgement about others (e.g., selection committees, venture capitalists, team leaders, etc.), i.e., the supply side of attention. These are considered separately below.

For individuals being judged (the demand side) this chapter highlights the double-edged sword of charisma, consistent with past research (Vergauwe et al., 2018). Whilst charisma is primarily perceived as a positive characteristic, and actively trained in leadership training courses, this paper also shows that its benefits are limited. For example, job candidates with bad KSAOs or entrepreneurs with bad underling projects will not be able to glaze over these issues by being charismatic and might in fact draw further attention to the limits of themselves/their products. Whilst in the current study even low-quality candidates benefited from being charismatic, it is also worth noting that the low-quality candidates in this study did not have any extremely negative information, however, if they had, the data suggests that this would be more likely to be attended to for charismatic candidates and the effects could have been more negative. Moreover, there is also an opportunity cost of training to be more charismatic and individuals could be better off improving the underlying quality of the information they are sharing. Finally, there is also a more nefarious implication for individuals receiving judgements, which is that to receive the most positive judgement individuals would be best served by charismatically presenting the good information and less charismatically presenting the bad information. Whilst this is arguably unethical, it is an interesting practical question to consider whether employees, leaders, and entrepreneurs are already doing this instinctively in their delivery of information. In other words, how can individuals make information "hide in plain sight".

For individuals forming judgments this chapter highlights the key role of judgement differentiation. Notably, when job candidates were more charismatic the differentiation in judgements of candidate quality were considerably higher than when candidates were uncharismatic. Therefore, if we consider the main goal of a selection committee to determine the best candidate, one could argue that all the candidates being charismatic would help organisations do this. This is also echoed in the findings supporting hypothesis 1, which showed that the more information participants remember the stronger the differentiation between high- and low-quality candidates was. Ultimately, the underlying contribution here for organisations is that attention is a valuable resource and the more a selection committee is able to pay attention and remember the information shared the more successful the selection process will be. Therefore, organisations should take steps to make sure individuals tasked with selection are able to fully pay attention during the selection process, whether that is through training to improve attention capacity (e.g., meditation; Malinowski, 2013), reducing interruptions (Leroy, 2009), or by generally reducing the cognitive load on employees (van Knippenberg et al., 2015).

Future Directions

As this dissertation to some extent marks the start of programmatic research on social attention in organisations, there are bountiful future directions to be explored. A number of these have been identified above, including integrating micro and macro perspectives on attention in organisations, in this section three broad avenues that future scholarship could work on, will be highlighted.

The first is a demand side question: how can individuals *win* the battle for attention? There is a near endless number of social categories that individuals can fall into, this chapter examined just one in charisma and found that this led to individuals receiving significantly more social attention. An important next step is to further understand the social attention landscape by examining the other factors that systematically bias attention. Research from psychology would suggest that attractiveness (Ma et al., 2015), power (Mason et al., 2010), and status (Giesbrecht et al., 2017) are likely to increase social attention, but nevertheless it would be important to demonstrate this in the organisational domain at the very least so that moderators can be

examined. Further, there could be more idiosyncratic factors that bias attention, such as personality matches between social actors, the closeness of others in one's network, or the clothes that one wears. However, perhaps the most critical domain to understand bias is in demographic differences, e.g., race, gender, age, etc., given that research has already found considerable evidence for downstream discrimination in these domains. Gender is examined in the following chapter; however, it is still important that other demographic factors are examined as systematic deviations in attention could contribute to adverse impact within organisations.

The second is a supply side question; how do individual difference and contextual factors affect how much individuals pay attention to others in naturalistic work environments? Research from cognitive psychology has found individual differences in attention but these are usually related to underlying cognitive abilities, e.g., working memory. However, it is also possible that less ability-based factors also affect social attention, such as individual's personalities, with the extraversion-introversion spectrum being an obvious starting point given its relevance in the social domain (Akert & Panter, 1988; Li et al., 2010; Riggio & Riggio, 2002). More specific to organisations it would be interesting to see if conscientious individuals, who are typically found to perform better in organisations (Barrick & Mount, 1991; Dudley et al., 2006), are also more diligent in paying attention to others. Equally, daily variation across individuals in factors such as emotions, mindfulness, or sleep quality could all affect social attention. Finally, more field specific individual's difference factors could be examined, for example, researchers in the justice domain could examine whether individual's moral identity affects the extent to which they attend to others, as "not paying attention to a job candidate" is an element of procedural fairness (Colquitt, 2001; Colquitt & Rodell, 2015). Similarly, research can consider contextual factors that affect social attention, including but not limited to breaks (Trougakos et al., 2008), reducing interruptions (Leroy et al., 2020), and removing distractions from connected devices (van Knippenberg et al., 2015).

The goal of both these lines of research, individual difference and contextual, is to understand how organisations can ensure employees attention is appropriately allocated to facilitate organisational success.

Note, the goal is not to maximize employee attention at all times, in fact, it might be that employees would benefit from rest in order to restore motivation to pursue certain goals (Bernstein et al., 2018). Therefore, the managing of attention is more of a holistic process that requires ensuring that employees are a) paying attention to information the organisation is directly sharing with them, b) directing their attention at work to the most relevant work goals, and c) devoting attention to their own personal needs, e.g., well-being and self-esteem, through processes such as detachment, in order maximize their own productive potential. This last point is particularly critical and overlooked in macro-level models of attention (Ocasio, 1997, 2011). After all, the relationship between employees and organisations is a non-zero sum game (Wright, 2001), thus, the organisational overall goal to efficiently direct employee's cognitive resources to pursue organisational goals, is generally commensurate with the employees' goals to derive meaning from their work and preserve well-being. A particularly interesting direction for this research would be to examine the role leaders play in guiding employees' attention. In sum, there are a myriad of contextual and individual difference factors that could affect social attention and beginning the process of uncovering these will further contribute to the social attention landscape.

Chapter Summary

This chapter sought to empirically investigate the dynamics of social attention in the workplace. Extending the lens model, the importance of cue sampling in judgement formation was theoretically specified and then support empirically. Specifically, it was shown that selectors who sampled more cues from their environment also show greater judgment differentiation between high- and low-quality candidates. This highlighted the supply side benefits of attention for organisations. This chapter's second focus was on demonstrating how individuals can capture others attention in order to win the battle for attention. Choosing a low hanging fruit, the paper focused on charisma and again theoretically specified how this person characteristic could attract attention from others and then empirically demonstrating across a variety of operationalizations of social attention. Intriguingly, using longitudinal analyses, this chapter showed that charismatic individuals did not receive more attention at the beginning or end of the interview but instead

were able to "maintain" attention throughout the middle section of the interview. Finally, corroborating the broader theoretical role of attention, this chapter found that the benefit of charisma (and capturing social attention) varied based on the underlying quality of the job candidate, with high-quality candidates benefiting more from charisma than low quality candidate. These findings are aggregated below:

KEY FINDINGS & TAKEAWAYS

Cue Sampling Improves Judgement Differentiation	As the number of cues sample increased so did the judgement differentiation between high- and low-quality candidates.
Charisma-Based Attention Capture	Charismatic individuals receive more attention from observers than less charismatic individuals.
Charisma Sustains Attention over Time	Charismatic individuals receive similar amount of attention to non-charismatic individuals at the beginning and end of the interview but significantly more during the middle of the interview, suggesting that charisma operates by sustaining audience's attention.
Varying Benefits of Charisma	High quality individuals benefit more from being charismatic than low quality individuals, suggesting that social attention is more beneficial when individuals are more likely to receive a positive judgment

CHAPTER 3

SOCIAL ATTENTION AND DECISION MAKING

Decision making within social groups is one of the most complex and common social tasks people engage in (Cohen et al., 1972; Schulz-Hardt et al., 2000). Imagine you had to make a choice with a group of six friends about what two pizzas to order and your goal was to make the decision that made the most people happy. To do so, you would need to pay attention to each of the friend's unique points in favor of different toppings, whilst remembering what pizzas are available, and then combine all this into two specific decisions. If you have been in this position, you have probably heard people frequently remark, "wait, what do people want again?", and in the end decide to just settle things by electing one person to make the decision. This decision would be easier if people put their preferences into a spreadsheet and you simply calculated the optimal choice. However, decision makers in social environments do not have that luxury. Decision-relevant information is constantly occurring and disappearing so that any time spent trying to mentally combine people's preferences means the decision maker is likely missing the next piece of social information. This challenging, and seemingly farcical, nature of social decisions is why scholars have referred to this process as a "garbage can", with an inevitably suboptimal decision being spat out at the end (Cohen et al., 1972).

Unfortunately for organisations, this 'garbage can' is one of the critical determinants of firm success (Cyert & March, 1963; Gavetti et al., 2007). Despite its inefficiencies decisions in organisations are inevitably made by groups of social actors whether that be in a project team, C-suite, task force, or department. Research has found that it is challenging to keep individuals engaged in work-related meetings as they can be lengthy and feel unproductive (Rogelberg et al., 2006). Nevertheless, despite some companies' efforts to reduce the number of meetings (Perlow et al., 2017), they are still a critical mechanism through which organisations share information across different groups/sectors in order to make decisions (Gavetti et al., 2007). Therefore, in our quest to understand the nature of the firm, it is critical to also understand how information is processed within these social situations.

Decision scientists have long considered the puzzle of how individuals process and utilize decision relevant information in order to form judgements and make decisions. This "information processing" paradigm of research (Oppenheimer & Kelso, 2015a), defines decision making through three sequential cognitive processes: sampling, retrieving, and integrating information. Organisational research has considered these information processing stages by examining how individuals use past experience to inform judgement (i.e., retrieval) and how this is integrated with the sampled information to weighting decision cues and make decision (i.e., integrating); for a review see Fischhoff & Broomell (2020). However, research has not closely examined how individuals sample information, and the limited existing research has focused on sampling information on non-social situations which present a vastly different challenge on the attention system (Orquin & Mueller Loose, 2013; van Knippenberg et al., 2015).

To underline this neglect, researchers typically use attention checks to check that participants did sample the decision relevant information, and if participants did not sample the information then the research feels justified to exclude this 'dirty data' (DeSimone & Harms, 2018; Oppenheimer et al., 2009). However, as this dissertation has reiterated, failure to sample information (i.e., inattention) is actually a critical variable of interest and worthy of direct study. Therefore, this chapter examines the role of social attention in social decision-making.

Considering social decision-making through the social attention lens described thus far in this dissertation provides insights into why this process is so challenging. As discussed in the Literature Review and Chapter 1, the primary role of attention is to help us pursue incomplete goals and update our model of our environment (Pitts et al., 2018). In simple social environments, e.g., chatting with friends, the social environment is relatively stable and thus individuals can drift in and out of the conversation to pursue their goal, i.e., responding to their friend's statements, without any major problems. However, when decisions are being made in social groups, the social environment is changing very quickly, and each new piece of information could be critical to making an optimal decision. Therefore, individuals must constantly be paying attention and sampling the available information, in order to pursue their goal of making a decision.

The issue this dissertation addresses is when this complex process of sampling information from the environment is combined with the competition for attention discussed in the previous chapter. From the decision makers perspective each person in the group is competing for their attention. On top of this, each decision maker also has all of their other incomplete goals which are competing for their attention, as discussed in Chapter 2. Therefore, the decision individuals arrive at is both a) a function of their perception of the information shared and b) a function of which members of the group are able to capture the attention of the decision maker. This second process is particularly intriguing because in an idealized world (in which cognition was not bounded) individuals would attend to all information being shared. However, due to our bounded cognition, individuals cannot feasibly pay attention to all the information. In other words, to use terms borrowed from macro-level research, the decision-makers attention cannot be efficiently allocated to the decision relevant information available. Further, and more intriguingly, decision makers attention will be allocated to those who are able to capture their attention. For example, decision makers would likely pay more attention to information shared by the most senior people in the meeting, because their status captures the decision maker's attention (Giesbrecht et al., 2017; Reschke et al., 2018). Using the terminology from the Behavioural Theory of the Firm (Cyert & March, 1963), this would systematically bias attention toward information shared by certain individuals (e.g. high status or charismatic individuals). The result of this is that individuals who are better able to capture their audience's attention will have a greater influence on decision outcomes.

This chapter addresses whether an inequality in how decision makers pay attention to information shared by different group members can lead to an inefficient allocation of attention and ultimately sub-optimal decision making. To address this chapters is split into three sections. The first section, "Cue Sampling Failures", examines the role of *cue sampling* in social decision making, integrating this concept with existing theories of decision making in applied settings. The second section, "Gender Attention Bias", considers how attention in social groups could be biased to favor men. The third section then integrates these two

perspectives to theorize how biases in cue sampling, resulting from a gender attention bias, could lead to impairments in decision making.

Cue Sampling Failure

Research on decision making in applied context has drawn heavily from the Lens Model (Brunswik, 1952). The Lens Model is a meta-theory that provides a descriptive model of how individuals use information in their environment to make decisions (note, within this model, decision-relevant information is termed 'cues'). Research on the lens model has been applied to understand decisions in domains including medicine, business, education and more (for meta-analyses see, Karelaia & Hogarth, 2008; Kaufmann et al., 2014). The contribution of this model is that it distinguishes between two stages involved in decision making (Karelaia & Hogarth, 2008). The first stage concerns the relatedness of a cue with the criterion (i.e., the aspect of the environment one wants to understand). For example, when ordering food at a restaurant the criterion would be the tastiness of the dishes, in which case the reaction of other customers to the dishes would be a cue strongly related to this criterion. Alternatively, the number of ingredients would be a cue not so strongly related to the criterion. Within the lens model, the strength of the relationship between the cue and the criterion is referred to as the *cue validity*. If individuals had perfect knowledge of the cue validities for each decision, they could simply compute these values and make decisions based purely on this. However, humans do not have perfect knowledge (Simon, 1957) and thus the judgements individuals make are partly based on the extent to which the use each available cue. This is the second stage of the lens model – the extent to which decision-relevant information influences one's judgement – and is termed *cue utilization*. For example, when choosing a dish at a restaurant a customer could ignore the reaction of other individuals based on the belief that they have 'different tastes' to the average person. In other words, judgements are not based purely on the quality of available cues (i.e., cue validity), but also on the internal psychological processes of the decision-maker that determine which cues are utilized. To represent this the lens model is depicted with the decision on one side, the criterion on the other, and the cues in between, see Figure 6.

Based on the lens model, probabilistic mathematical equations can be used to understand how individuals use cues in their environment to make decisions. Within organisational behaviour the lens model has most prominently featured as the theoretical basis of policy capturing studies (for description see Karren & Barringer, 2002). Policy capturing is a method in which individuals weighting of different decision cues can be calculated by having individuals make multiple decisions in which each of the cues systematically vary. By expressing decision-making as the mathematical weighting of different cues in the environment, scholars can unpack how expert judgements are formed, methods for improving judgements, the effects of inter-cue redundancy, and so on.

However, this strength of the model is also its weakness. By focusing on mathematical modelling, the lens model assumes that all cues are available to the decision maker (Brunswik, 1952; Karelaia & Hogarth, 2008). If a cue is not available to a decision maker, then it will automatically be weighted as 0. However, according to the lens model this would confound the 'availability' of a cue with the 'utilization' of a cue. For example, there could be a cue that individuals would utilize but they missed this information because they were paying attention to something else, i.e., selecting other information to process. Therefore, theoretically speaking, individuals *cue sampling* is a distinct process from their cue utilization, and a process that is not considered within the lens model and research on applied decision making.

Cue sampling is defined as the awareness of the available decision relevant information in one's environment. Therefore, cue sampling is related but distinct to the processes of 'advice seeking', where individuals actively ask/probe individuals in their environment for information (Lim et al., 2020). Cue sampling a particularly critical process in social decision making because of the inherent challenges of social attention. As described in Chapter 1 & 2, social attention is limited with roughly one piece of social information being processed at a time and thus selection trade-offs having to be made by individuals deciding what to pay attention to (Simon, 1991). As a result, cue sampling failures are seemingly inevitable in social decision making. Cue sampling as a process thus makes the critical distinction between an 'available cue that is not sampled' and an 'available cue that is not utilized'; note, in the lens model these two

processes are treated as equivalent (Brunswik, 1952). If we consider cues to be discrete pieces of information, as in Chapter 1, then cue sampling can be considered a binary function of whether individuals did sample (1) or did not sample (0) available information. The general limitations on social attention (not considering social attention biases) would produce a random error in individual's ability to sample information from their environment. This can be represented within the lens model as shown in Figure 7 with unsampled cues being 'disconnected' to the decision maker's judgement, note, these unsampled cues maintain their cue validity as this is a distinct process to cue utilization.

This cue sampling failure hypothesis - stated simply as the prediction that individuals will not sample all available decision cues - is consistent with Hebert Simon's (1957) concept of bounded rationality along with the cumulative research on the limits of attention in cognitive science (Sanborn & Chater, 2016; Treisman, 1969; Von Helmholtz, 1867). This broad hypothesis provides a foundation for examining the role of social attention in social decision making. For example, considerable research using the lens model has examined the impact of an increasing number of cues on decision (Kaufmann et al., 2014). Meta-analytic work suggests that in general increasing the number of cues impairs decision making (Karelaia & Hogarth, 2008). This counterintuitive finding, that more information does not lead to better decisions, could in part be explained by cue sampling failures. Given that individuals can only pay attention to a subset of the available information within a social interaction, and that once attended to only a limited amount of this information can be stored in working memory (Cowan, 1998), it is expected that there is a threshold amount that individuals can pay attention to. It is even possible that at the number of cues increase, this increases stress for the decision maker to try and synthesize all of the available information.

In sum, cue sampling failure plays a critical role in individual decision making in social environments because. If information isn't attended to, it cannot be judged or considered. Therefore, an unsampled cue in the lens model is mathematically equivalent to an unutilized cue, although the theoretical process of not utilizing a cue and not sampling a cue are extremely different. This is expressed in the following "cue sampling failure" hypothesis:

Hypothesis 1: Individuals will not sample all available cues in social decision making.

The above discussion focuses on random errors in the information individuals attend to. However, it is also possible that there are systematic errors in attention resulting from social attention biases. This next section considers this latter issue in more detail by examining how social factors such as gender could affect how we sample information from other social actors.

Gender Attention Bias

To "Achieve gender equality and the empowerment of all women and girls" is one of the United Nations Sustainable Development Goals (United Nations, 2015). Gender inequality is particularly rife in the workplace with women holding only 28% of the managerial positions worldwide (United Nations, 2015). A root of this inequality is believed to be in the differential treatment of men and women within organisations. Gender discrimination permeates all domains of the modern workplace: from hiring (Isaac et al., 2009), to pay (Blau & Kahn, 2003), to promotion (Bosak & Sczesny, 2011). It was only in 1975 that the Sex Discrimination Act was passed in the UK which prohibited gender discrimination in the workplace, indicating the challenge society has faced in tackling this issue.

Gender discrimination at work can occur as the result of institutional factors (Moss-Racusin et al., 2012) and/or explicitly sexist behaviours, e.g., biased algorithms (Lavanchy, 2018). However, recent attention has been given to the psychological discrimination of women in the workplace, such as implicit beliefs and stereotypes (Heilman & Caleo, 2018). The psychological process is thought to contribute to the invisible Glass Ceiling that hinders the progression of women within organisations (Barreto et al., 2009).

The dominant psychological account of why gender discrimination in the workplace exists is that the behaviours of women at work are judged differently to the same behaviours of a man (Eagly & Karau, 2002; Heilman & Caleo, 2018; Moss-Racusin et al., 2012). For example, research has found that when men express feelings of anger they are judged to be of high status, however, when women make the same emotional

expression, they are judged as being low status (Brescoll & Uhlmann, 2008). Research has also found that when women talk more than men in a social situation, they are judged more negatively than if men talk more (Brescoll, 2011). These perceptual differences are argued to contribute to women's challenges in the workplace, such as when they are in leadership positions (Brescoll, 2011). This *judgement-based account* of gender discrimination is based on evidence from social psychology that women are perceived differently by society (Cuddy et al., 2008). These different perceptions of men and women lead individuals to form contrasting judgements (Eagly & Karau, 2002). In other words, individuals are recalling their beliefs about women in general (from long-term memory) and combining this information (in working memory) with the current behaviour they are observing to form a judgment. Therefore, this is a process of higher-order cognition occurring after the social information is selected from the environment.

This chapter proposes an attention-based account of gender discrimination. The central tenant of this theory is that – ceteris paribus – social information shared by women is attended to *less* than information shared by men, i.e., a gender attention bias. This theoretical proposition is bolstered by both empirical and qualitative evidence. First, research has found that certain individuals (e.g. high power/status) receive more attention than others (e.g. low power/status), indicating that biases in attention can occur at this level of processing (DeWall & Maner, 2008; Giesbrecht et al., 2017). Second, a gender attention bias is consistent with other findings in the literature on gender discrimination at work. For example, the finding that women speak less than men in social situations (Brescoll, 2011), could be attributed to them receiving less attention than men as there is little merit of talking if others in the environment are not listening. Further, the challenges faced by women in leadership roles could also be attributed to a dearth of social attention from followers (Eagly & Karau, 2002). Third, there are numerous qualitative anecdotes suggesting that women receive less attention at work. To take two prominent examples, 1) In her book "Lean In" Sheryl Sandberg (Facebook CTO) argues women need to be more assertive in the workplace in order to have their voices heard and not be ignored (Sandberg, 2013) and 2) when Michelle Obama was a member of White House meetings, she would gather all the female participants beforehand and make sure that when any of

them shared information another female participant would repeat that to make sure that it was registered by the audience and not ignored, this was called the "amplification strategy" (Crockett, 2016).

The theoretical grounding of the proposed gender attention bias is, like the judgement-based account, in the differing perceptions of men and women. In a decision-making scenario, individuals' goal is to search for decision relevant information in order to make a decision. Underlying perceptions that women are less competent (Cuddy et al., 2008), suited to leadership roles in the workplace (Schein & Davidson, 1993), and lower status (Wagner & Berger, 1993), could result in the information that women share being expected to be less valuable to a decision maker. Therefore, based on this (incorrect) biased perception about women, a goal-directed decision maker would pay attention more to social information shared by men because individuals perceive this information to be more valuable in the pursuit of their goals.

The theoretical process above would be the result of a momentary goal of individuals to search for valuable decision relevant information. However, it is also possible that a gender attention bias could be the result of a chronic goal to focus on information shared by 'important' members within the organisation, that becomes ingrained over time. To explain, I will describe research that has shown that attention biases can be learnt over time through Attention Bias Modification Training (Bar-Haim, 2010). The trainings work through Pavlovian conditioning. For example, anxious individuals who have an attention bias toward threat cues are shown two pictures side by side (one threatening image; one not threatening image) and then see a cross appear on one of the two sides (MacLeod & Clarke, 2015; Mogg & Bradley, 2016). The participants are rewarded for correctly reporting which side of the screen the cross appeared. The training works by disproportionately putting the cross on the side of the screen where the non-threatening image was displayed. As a result, over time, participants will instinctively look to the non-threatening image as they have been conditioned to associate this with the location of the cross, participants then carry this conditioning into the real world and this training has been shown to be effective in treating psychological challenges such as high anxiety (Bar-Haim, 2010).

Applying the logic of Attention Bias Modification Training to the workplace, participants will have developed biases in social attention based on who they have been previously been rewarded to pay attention to. Within a workplace setting it is most likely that observers will pay attention to mangers and individuals in leadership position as the information they share is the most valuable. If we consider that leadership positions are generally held by men (Schein & Davidson, 1993), and 72% of managerial positions globally are held by men (United Nations, 2015), then when individual's attention is "cued" toward the leader/manager then it is also being disproportionately cued toward male faces. In other words, through a social conditioning process, individuals are learning to associate important information with males. Therefore, when they search for information in a social environment their attention will be biased toward males.

Based on these two arguments this chapter hypothesizes a gender attention bias. Notably, these two theoretical arguments draw on the same process – women are viewed a less competent and of lower status than men - but the first describes how this can occurs through individual's momentary goals and the latter to chronic goals ingrained over time. The critical distinction made between this attention-based account and the judgement-based account of gender discrimination is the stage of cognitive processing that the bias occurs. An attention-based account argues that there is a cognitive bias occurring before the judgement stage. Therefore, the two are not competing accounts of the same phenomenon but distinct sequential stages of the same phenomenon: gender discrimination. The importance of distinguishing between these two processes is both theoretical and practical. Theoretically, understanding the causal process through which gender discrimination emerges can provide a broader generalizable theory about how all forms of discrimination emerge. Further, separating between cognitive processing at the stage of attention and judgement has ramifications for all fields of organisational behaviour interested in how judgements are formed, e.g., ethics, decision making, job attitudes, and employee evaluations. The gender attention bias hypothesis is stated below:

Hypothesis 2: Males receive more social attention than females in decision making settings.

From a micro-organisational perspective, the gender attention bias can be seen as a product of gender stereotypes in the workplace that lead to men capturing the attention of their audience more than women. However, from a macro-organisational perspective and through the lens of the behavioural theory of the firm, the gender attention bias can be viewed as a heuristic search process (March & Simon; 1967; Gavetti et al., 2007). In other words, when information is integrated across different groups within an organisation, information that is shared by men is attended to more by the firm than information shared by women. Then, if we assume that the information shared by men and women is of equal value to an organisation, this search process leads to inefficiencies in how individuals within an organisation allocate their attention to the information available in group decision-making scenarios. Building on this, the next section considers how decision making operates within groups and how a heuristic search process (favouring information shared by men) could result in sub-optimal decision making in groups.

Figure 6
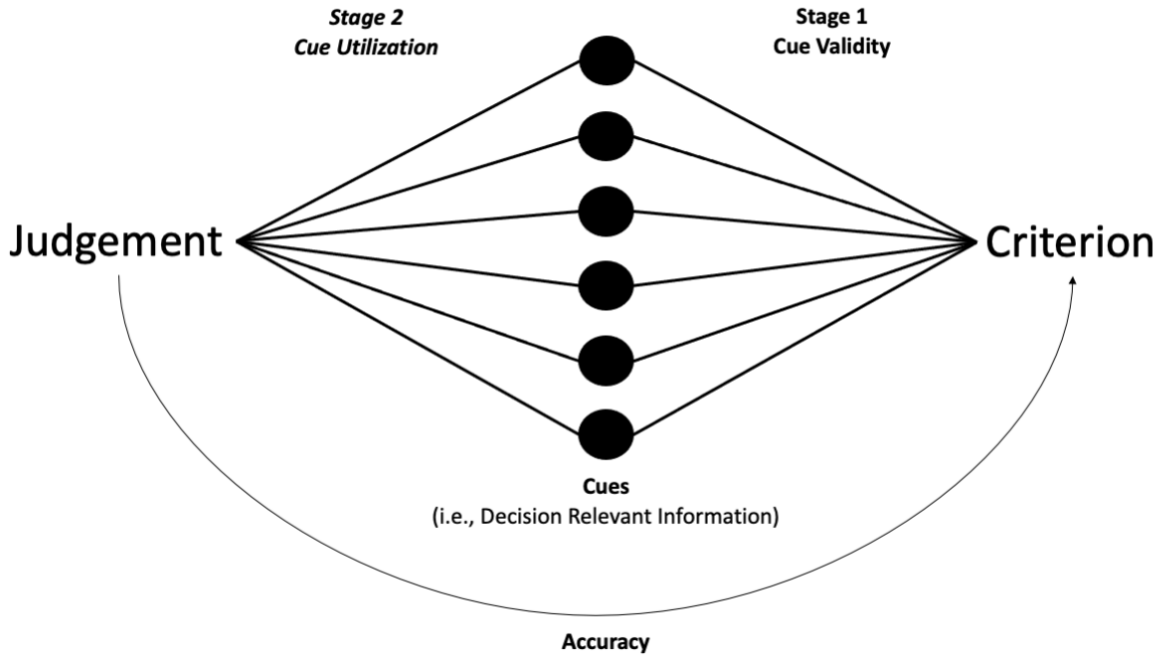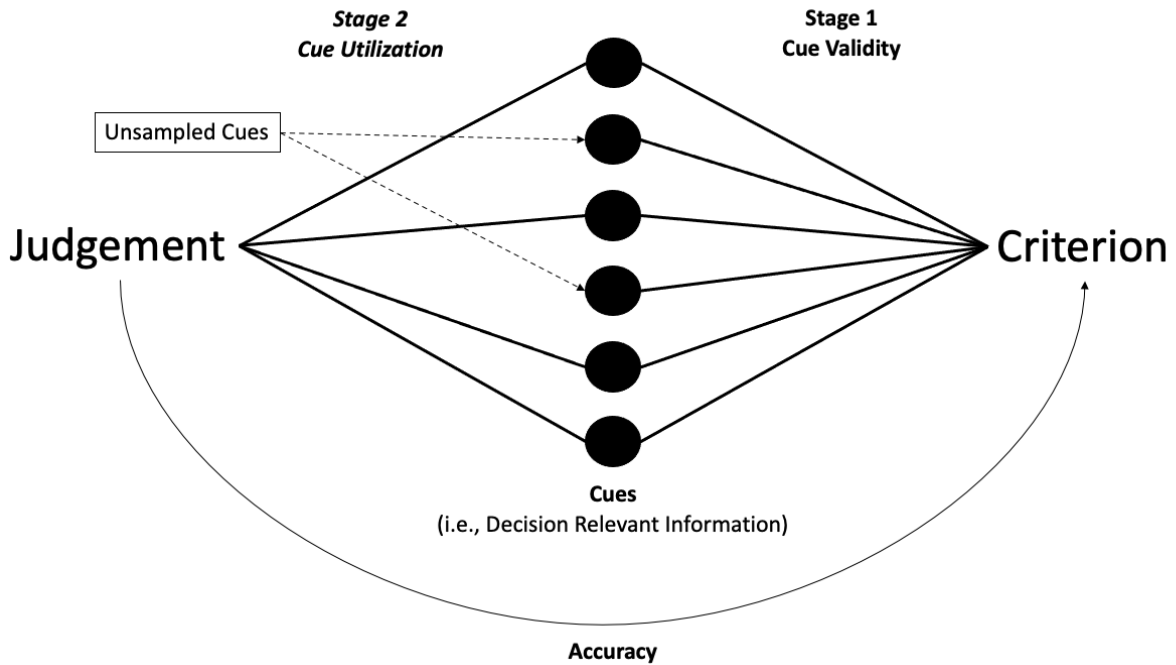An adapted version of the Brunswick Lens Model.

Figure 7
The Lens model with two cues not being samples, i.e., a sampling failure.

Social Decision Bias

Research on decision making has focused extensively on the topic of bias. The Heuristics and Biases Program of research initiated by Amos Tversky and Daniel Kahneman focused on identifying scenarios in which individuals displayed 'irrational' biases in decision making (Kahneman, 2011; Kahneman & Tversky, 1979; Tversky & Kahneman, 1974). Understanding these biases both shines a light on the nuances of human behaviour and helps devise methods to nudge individuals toward making better choices for themselves and society (Thaler & Sunstein, 2009). More recent research examining the source of these decision biases has identified the crucial role of attention. For example, research has found that biases to favor risks that are positively framed compared to the same risk that is negatively framed (i.e., the framing effect), is partly explained by individuals paying more attention to information that is related to losses (Kreiner & Gamliel, 2018). As discussed in Chapter 2, goal-directed attention is systematically bias in order to maximize a limited (i.e. bounded) cognitive system that can only process a subset of the available information (Shah & Oppenheimer, 2008). This section explores how a similar process could operate in social decision making where cues (i.e., decision-relevant information) comes from other social actors who are all competing (consciously or not) for the attention of their audience. Incorporating the work on attention capture discussed in the previous chapter this section describes how this micro level process can impact group decision-making and thus the macro-level operations of the firm (Gavetti et al., 2007; Ocasio, 1997). In particular this chapter focuses on the gender attention bias, however, note that the same underlying logic would apply to any factor that leads to certain social actors capturing decision makers attention more than others (e.g., charisma, status, or attractiveness).

To model the effect of the gender attentional bias on social decision making this section will use a hypothetical decision scenario. Consider a scenario where two colleagues (a male actors and a female actor) are discussing a decision of where to open a new shop, in New York or Los Angeles. Both actors (and the participant) have met to discuss the options and make a decision. In the meeting the male actor shares 4 cues in favor of opening a shop in New York and the female actor shares 4 cues in favor of Los Angeles. To simplify

the model, assume that all the shared cues are equally valid and therefore that New York (with 4 cues) and

Los Angeles (with 4 cues) are equally good locations. We can then represent this decision using a variation of

the lens model (Figure 11a), having one decision maker (i.e., the participant) and having two separate

judgement criteria (New York and Los Angeles). Next, we can assign the cues to either the male actor by

making these cues red, or to the female actor by making these cues blue. Note, in this model we have

incorporated the prediction that there are *random* cue sampling failures (Hypothesis 1) for the information

shared by each actor (1 cue missed).

In the decision between New York and Los Angeles there is no wrong answer as there are a balanced

number of cues (with equally cue validity) for each option. However, whilst there is not a sub-optimal

decision, there is still a sub-optimal decision-making process (Gavetti et al., 2007). In a scenario in which all

the information shared by each actor is equally valid, an optimal cue-sampling process would sample equally

from the cues shared by the male actor and the female actor However, if we consider that the male actor

captures the attention of the audience more than the female actor, then it follows that the cues shared by

the male actor would be sampled more than those shared by the female actor. Increased attention toward

the male actor would thus result in a decision bias toward New York, as the cues shared by that actor are in

favor of New York. This cue sampling bias is represented in Figure 11b.

This model can be generalized into a theoretical argument. In social decision-making scenarios,

decision makers' attention will be biased toward cues shared by actors who capture the attention of their

audience more. Increased attention will result in a biased increase in cue sampling from this actor which in

turn leads to decisions that skew in favor of the information (e.g., opinions) shared by this actor. In line with

the gender attention bias, this chapter investigates whether this attentional mechanism is a key mechanism

perpetuating gender discrimination. This biased skew in decision making is represented as Hypothesis 3

Hypothesis 3a: Social decision making will be biased in favor of the information shared by male individuals

(i.e., more attended to social actors).

The cue sampling bias described above can also lead to suboptimal (or optimal) decisions in scenarios in which two choice options are not equally valid. If we adjust the decision scenario between New York and Los Angeles by adding one additional cue for Los Angeles shared by the female actor, then the optimal decision in this scenario becomes Los Angeles (5 cues) and not New York (4 cues). A decision maker with unbiased sampling errors should sample more valid reasons for Los Angeles than New York. However, when we incorporate the sub-optimal decision process resulting from biases cue sampling from actors who capture the attention of the audience more then the individuals could still systematically favor New York over Los Angeles. Equally, if the female actor (in favor of Los Angeles) captures the attention of the audience more then the decision would systematically favor Los Angeles. Note, whilst this is the optimal outcome it is still the outcome that would have been favored if the system was not biased and thus does not improve the decision-making process. Therefore, if we consider that multiple decisions are made within an organisation, in the long run (assuming information shared by different actors is equally valid) the cue-sampling bias will lead to sub-optimal decisions by an organisation. The sub-optimal results of this bias are represented in Figure 11c. This argument is also represented at hypothesis 3b:

Hypothesis 3b: Cue sampling bias will lead to sub-optimal decision making when female individuals (i.e., less attended to social actors) share information in favor of the sub-optimal option.

The two preceding hypotheses consider scenarios in which all decision cues are equally weighted, however, in reality this is likely not the case. In particular, considerable research in team decision making scenarios in which there is one critical piece of information that must be identified (Stasser & Titus, 2003). These challenges for group decision making are typically referred to as 'Hidden Profile' tasks and usually result from information not being shared by team members. However, if we consider cue-sampling failures due to inattention, then the same group decision making failures can result from individuals not paying

attention to shared information. In other words, unattended-to information is equivalent to unshared information.

We can represent this issue within the decision scenario between New York and Los Angeles by making one of the cues for Los Angeles a 'critical cue' and assigning it a higher validity than all other cues, meaning that the optimal choice becomes Los Angeles even if it has the same number of cues (4) as New York (4 cues). In such a scenario, similar to Hypothesis 3, if one actor captures the attention of the audience more than the other, then in the this will lead to a sub-optimal decision-making process (assuming there is an equal likelihood that the male actor or the female actor would know the critical information). This is another mechanism through which social attention bias can result in biased information search and thus impaired decision making. The is represented in Figure 11d and hypothesis 3c:

Hypothesis 3c: Cue sampling bias will lead to sub-optimal decision making when female individuals (i.e., less attended to social actors) share critical information for decision making.

Note, the three hypotheses stated above all draw on a similar theoretical logical, that bias social attention will impair decision making. There primary difference is in the structure of cues in the decision. In hypothesis 3a, the cues are balanced for each decision option. In hypothesis 3b, there are more cues for one option than another. In hypothesis 3c, there is one critical cue. Each of these hypotheses will be tested individually. However, it is important to note that support for any of these hypotheses individually or in combination provides support for the overall hypothesis (termed, hypothesis 3), that the gender of social actors can sub-optimally bias decision making.

Figure 11a

Depiction of a decision involving the judgement (made by participant) of two separate locations for a new business venture: New York & Los Angeles. Note, it is assumed that the cue utilization and cue validity is equal for all cues.

Figure 11b

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue). In this example, more cues are sampled for New York than Los Angeles, making this appear to be the optimal choice. Tests hypothesis 3a.

Figure 11c

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue) *and* including an extra cue for Los Angeles. In this example, despite there being more cues for Los Angeles, the decision samples more cues for New York and thus makes a sub optimal choice. Tests hypothesis 3b.
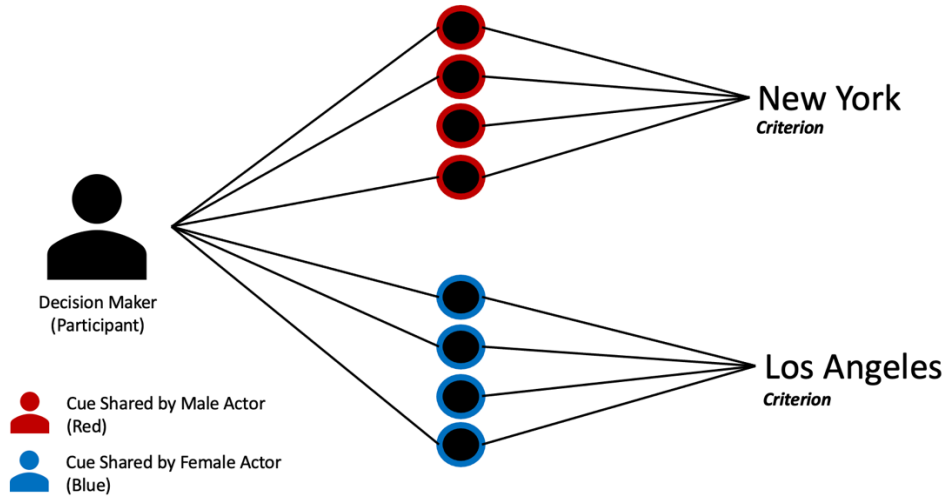

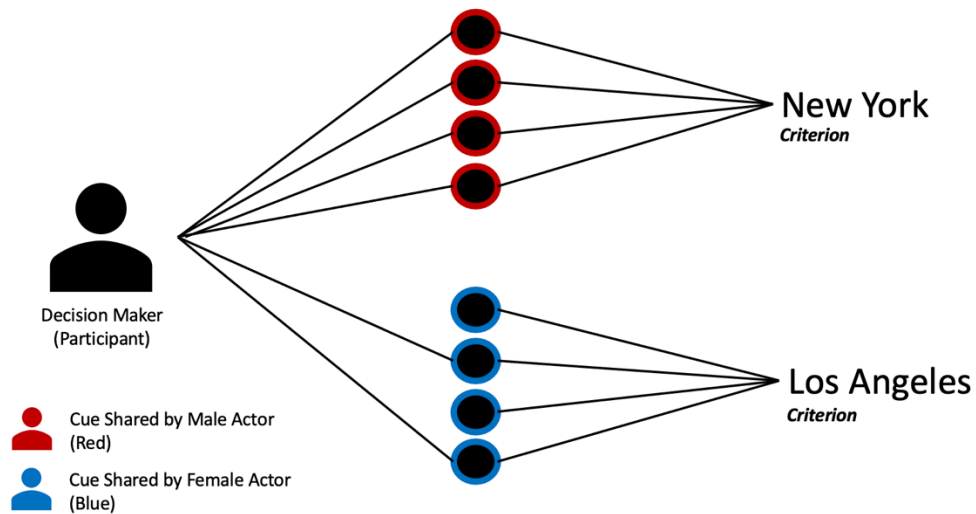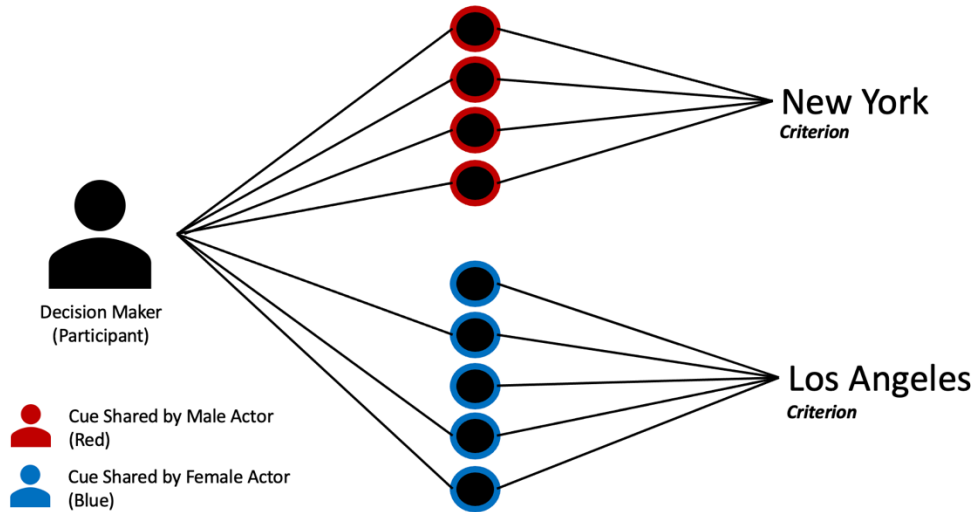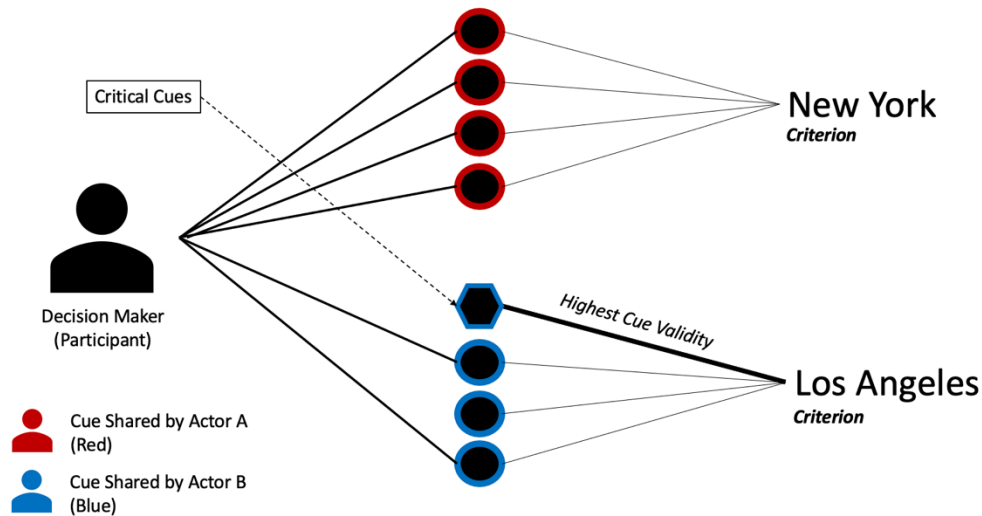**Figure 11d**

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue) *but* one of the cues for Los Angeles is the critical cue with the highest cue validity. In this example the decision maker misses the optimal cues and thus makes a sub-optimal choice. Tests hypothesis 3c.

The final mechanism through which social attention impacts social decision making moves away from how biases impact decision outcomes and instead focuses on how individuals receive credit for their contribution to the decision-making process, or if they are seen to be 'social loafing' (George, 1992). Many decisions in group settings are agreed by consensus amongst the group, however, whilst this means no individual decisions need to be made individuals still form judgements about the other social actors in terms of how they contributed to the decision. Perceived level of contribution could impact the extent to which group members are rewarded for their efforts either formally (e.g., promotion) or informally (e.g., trust; Mayer et al., 1995). Perceived contribution is particularly important when two individuals share the same piece of information at two different time points. For example, recalling the example from Michelle Obama in Chapter 2 women in social decision-making situations were encouraged to repeat what each other say to make sure that a man doesn't repeat it and receive credit for the contribution, the amplification strategy (Crockett, 2016). Similar findings have been found in 'who said what' paradigms, where participants need to correctly assign the statements made in the meeting to the social actors present (Klauer & Wegener, 1998). These findings align with the gender attention bias. If cues shared by women capture the attention of the audience less are more likely to be ignored, then it follows that women will receive less recognition for their contribution. In particular, in a scenario in which a piece of information is repeated by two different social actors, it would be predicted that the actor who captures the attention of the audience more is likely to receive credit for the contribution. This hypothesis is represented below:

Hypothesis 4: Male individuals (i.e., more attended to social actors) will receive more credit for their role in the decision-making process than female individuals.

Method

This study examines the limits of social attention within social decision-making and how social attention biases can systematically impact social decision-making. To examine this question a VR decision making vignette was developed that immerses participants in a group decision-making process: for the script

see the appendix. This scenario has four actors (2 focal; 2 non-focal) and two versions of the scenario were created in which the gender of the focal actors was manipulated (male vs. female). Vignettes were viewed using the Pico VR device (without built in eye-tracking).

Participants

A total of 92 participants were recruited from two university campuses in Singapore and were reimbursed for their time. Participants were then randomly allocated across two experimental conditions. Technical difficulties with the VR (e.g., video lagging due to computer being low on battery) led to 9 participants being excluded from analyses. The final sample was thus 83 participants of which 64.4% were female and the average age was 23.98 years old (SD = 5.56). Note, this sample size was lower than intended due to challenges in recruiting participants, making it below the pre-specified minimum for testing the pre-registered hypotheses. Therefore, this study should be best considered as a preliminary test of the hypotheses.

Participant Safety. All participants completed a scale measuring simulation sickness before starting the VR vignette and were told they could leave exit VR at any point by taking off their headset; note, no participants reported simulation sickness to the extent that they couldn't take part in the study (Stanney & Kennedy, 2010). Participants then completed the same scale immediately after completing the VR, with no participants reporting major adverse effects.

Procedure

This study used a between-subjects design, randomly assigning individuals to one of two experimental conditions. After being assigned to their condition participants viewed a 20-min VR vignette of a decision-making scenario. This decision-making scenario involves a team of decision makers (4) and the participant playing the role of an additional decision maker. The decision-making scenario (20-minutes) has a short introduction and conclusion either side of four separate decision-making scenes (2-5 minutes each). After three of the scenes participants were asked to: 1) make a decision based on the information shared, 2)

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recognize which statements were said in the meeting from a list, and 3) rate how important they viewed each

statement to be. The one different scene (consensus decision) had participants 1) make a decision based on

the information shared, 2) recognize who suggested which solution first.

After completing the VR vignette, participants answered a series of questions. This included,

psychometric measures of attention, social judgements, and simulation sickness, along with demographics.

VR Vignette

The VR vignette is of a social decision-making scenario in which a non-descript team has to make

decisions about a business venture. This vignette is based on a widely used negotiation case (Towers

Market; Weingart et al., 1993) in which shop vendors (e.g. grocery, florist, liquor store) have to make a

series of decision about a collective (physical) marketplace they will be joining, called Towers Market. In

this version of the case, the decision makers are not the vendors but a group of individuals seeking to

make an optimal decision given each of the vendors concerns. Each of the vendors' points (originally given

separately to each vendor) were adjusted in order to satisfy the requirements for hypothesis testing.

In the vignette, participants are told that two of the team members met with the vendors and

thus have the decision-relevant information. Participants are told to base decisions fully on the views of

the vendors and not any personal beliefs. The decision relevant information, referred to as *social decision*

cues, is allocated to Focal Actor 1 and Focal Actor 2. In all cases, Focal Actor 1 shared social decision cues

in favor of one option and Focal Actor 2 shares social decision cues in favor of another (opposing) option.

The actors do not argue for or against their points and instead just recount them for the team. The other

two actors (non-focal) comment on the points but share no decision relevant information.

The four decisions, designed to test the hypotheses 2-5, were as follows:

Balanced Decisions (Advertising). In the balanced decision, there were an equal number of social

decision cues in favor of the two-response option (advertise: collectively vs. individually). Therefore, both

responses are viewed as equivalent. In this decision, one focal actor shares all the social decision cues for one

response option (Focal Actor 1: advertise collectively) and the other focal actor shared all the social decision

cues for the other optimal decision (Focal Actor 2 (gender-manipulated actor): advertise individually). For example, if the decision is between apples and oranges, one focal actor would share all cues in favor of apples and the other all cues in favor of oranges. The balanced decision has 6 cues.

Unbalanced Decision (Clerks). In the unbalanced decision, there was an optimal outcome. This is because there were 4 cues in favor of "hiring clerks individually" and 3 cues in favor of "hiring clerks collectively". Therefore, if we assume that the cues are weight equally and individuals use a tallying heuristic (Gigerenzer et al., 2022) then participants who hear all the information (or at least listen in a non-biased fashion) would be more likely to choose the prior option.

Hidden Profile Decision (Maintenance). In the hidden profile decision, there is an optimal choice. This is because whilst there are 4 cues in favor of doing maintenance collectively and only 2 cues for doing it individually, one of the cues for doing maintenance individually is a critical cue. This critical cue is that "one vendor will drop out if the maintenance is done collectively", this cue is critical because the participants have been informed that if any vendor drops out then the whole market will fail. All the optimal choice cues are shared by one focal actor (including the critical cue) and all the sub optimal choice cues are shared by the other focal actor.

Consensus Decision (Location). In the consensus decision, the optimal decision is identified by the team explicitly (to build the market by the riverside) and thus the participants ability to identify this response option is not the focus of this scenario. Instead, this scenario examines whether participants can correctly identify which actor suggested the optimal solution and assigned credit accordingly. To do so, the scenario is designed such that the two focal actors suggest the same locations *but* focal actor 2 (gender manipulated) shares it at the beginning the meeting and focal actor 1 then shares the same cue at the end of the meeting. Importantly, when focal actor 1 shares the "riverside" idea, the rest of the team ignore this suggestion but when focal actor 2 then shares the same idea later, the team notice it and all agree that this is the optimal choice, the meeting ends with one of the non-focal actors saying, "okay, riverside it is then, decision made" (paraphrased).

The script for this scenario was created by the author of this dissertation in collaboration with a professional script writer. Feedback on the script was received by business school professors who study group decision making and boardroom meetings and the script was adjusted accordingly.

Actors were recruited through a professional recruiting agency and significant effort from the research team was put into identifying actors that were similar. All actors were a recruited from the same age range, all spoke using an American accent, and all wore business attire. The actors are described below, note, the gender of non-focal actor 2 was changed along with focal actor 2, this is in order to keep the gender and racial make-up of the group the same across the two conditions.

- Focal Actor 1: This actor was a white male aged 30-40 (see Male Actor 1)
- Focal Actor 2: This actor was *either* a white male aged 30-40 (see Male Actor 2) or a white female aged 30-40 (see Female Actor 1).
- Non-Focal Actor 1: This actor was a black male aged 30-40 (see Male Actor 3).
- Non-Focal Actor 2: This actor was *either* a white male aged 30-40 (see Male Actor 4) or a white female aged 30-40 (see Female Actor 2).

All actors attended 3 rehearsal days in which they worked with a director. The directorial guidance was written by the author and had actors focus on delivering information clearly and concisely and toning down the character's personality. Particular attention was given to actors playing the same role in order to match the prosody of their voice, personality of the character, and body language. The vignette was then filmed over three days using a professional filming crew.

Measures

Measures were administered both during the VR vignette and in a post survey. A break-down of the questions asked during the VR vignette along with a description of the study flow is provided in the supplement. After the VR vignette participants then complete a series of psychometric measures in a post survey (included below).

Decision. Participants were presented with response options after each decision scene and asked to choose one. For example, for the advertising decision they chose between advertising collectively vs. individually. For advertising, clerks, and maintenance, these decisions were binary choices between "individually" and "collectively". For location (consensus decision), the choice was between three locations: Riverside, City Center, and Industrial Site.

Memory. After making their decision participants were provided with 12 statements and asked to identify which ones were said in the meeting. The correct statements were all social decision cues. Note, this was only for the non-consensus decisions and not for the location decision.

Rating. After the memory test, participants then rated each of the social decision cues on a scale from 1 to 5 based on how important they viewed each cue to be. Again, this was only for the non-consensus decisions and not for the location decision.

Credit allocation. For the consensus (location) decision, participants were asked to select which of the four members of the meeting first suggested the "riverside", the optimal answer the group arrived on.

General Attentiveness (Post-Survey). The same 4-item scale measuring attentional engagement developed by Rothbard (2001) used in Chapter 1 and 2, $\alpha=.96$.

Intentional Mindwandering (Post-Survey). The same 4-item scale developed by Seli et al. (2016) used in Chapter 1 and 2, $\alpha=.80$.

Unintentional Mindwandering (Post-Survey). The same 4-item scale developed by Seli et al. (2016) used in Chapter 1 and 2, $\alpha=.87$.

Warmth & Competence. In line with Chapter 1, we measured perceptions of "team" warmth using three items (Warmth: warm, kind, understanding; Competence: competent, skillful, capable) developed by Fiske et al. (2007). Items were rated on a Likert scale (1 "Strongly Disagree" to 7 "Strongly Agree") : warmth ($\alpha=.94$); competence ($\alpha=.94$). Note, this measure was for the entire group, therefore, individual ratings of warmth/competence were not obtained.

Demographics (Post-Survey). Participants responded to questions concerning their age, gender, ethnicity, and nationality.

Results

Descriptive statistics are provided in Table 6, this includes, means, standard deviations, and correlations. Hypotheses were pre-registered in the dissertation proposal. All analyses were conducted using STATA, results for hypothesis tests are provided in Table 7.

To test hypothesis 1, the "cue sampling failure hypothesis", one-sample t-test were run comparing the total number of cues available with the number of cues correctly recognized by participants in the memory test. For each of the decisions the number of cues remember was significantly lower than the number of cues available. For advertising, out of the 6 cues mentioned participants on average recalled 4.69 (SD=1.15); $t(82)=-10.43$, $p<.001$. For maintenance, out of the 6 cues mentioned participants on average recalled 5.00 (SD=.98); $t(82)=-9.34$, $p<.001$. For clerks, out of the 7 cues mentioned participants on average recalled 5.40 (SD=1.41); $t(82)=-10.39$, $p<.001$. Therefore, there was support for hypothesis 1.

To test hypothesis 2, the "gender attention bias", we examined whether participants recalled information shared by Focal Actor 2 more in the condition when they were a male than in the condition when they were a female. To do so we regressed the number of correct statements recognized that Focal Actor 2 mentioned on the condition (1 "Female", 2 "Male"). No difference in memory was seen for recall of information shared in the advertising decision ($t(81)=-0.73$, $p=.467$), the clerk's decision ($t(81)=0.60$, $p=.544$), or the maintenance decision ($t(81)=-0.49$, $p=.624$). Therefore, hypothesis 2 is not supported.

To test hypothesis 3a, participants decision for the "balanced decision" was regressed on condition. No effect of condition was observed ($t(81)=-.82$, $p=.416$). Similarly, no support was found for hypothesis 3b, when participants decision for the "unbalanced decision" was regressed on condition ($t(81)=-.24$, $p=.811$).

To test hypothesis 3c, participants decision for the "hidden profiles" was regressed on condition. Results found that when the critical social decision cue was shared by a woman, on average, participants correctly answered the questions 70% (M=.70, SD=.46) of the time, whereas when it was shared by a

participants answered correctly 46% of the time (M=.46, SD=.51). This difference was significant (t(81)=2.29, p=.025), and strikingly in the opposite direction to that predicted for this hypothesis and by the gender attention bias hypothesis (H2).

To test hypothesis 4, who participants allocated the credit to for suggesting the "riverside" in the consensus (location) decision was regressed on condition. Note, the riverside was originally stated by Focal Actor 2, although repeated later by Focal Actor 1. Therefore, a dummy variable was created in which the selection of Focal Actor 2 was coded as 1, and the selection of any other actor was coded as 0. Results found that when Focal Actor 2 was female, participants correctly assigned credit to her 50% of the time (M=.50, SD=.51), however, when Focal Actor 2 was male, participants correctly assigned credit to him 31% of the time (M=.31, SD=.47). This difference was approaching significance/significant at the one-tailed level (t(81)=1.79, p=.077) and was again in the opposite direction to that predicted by this hypothesis and the gender attention bias (H2), although consistent with hypothesis 3c.

Exploratory analyses examined the relationship between condition and other measures that were not pre-registered in analyses. First, analyses examined whether participants important ratings of decision relevant information varied depending on the gender of the person sharing the information. However, results found not significant difference between condition in importance ratings. Next, post-survey scales were regressed on condition, but not difference was found between conditions for generalized attention (t(81)= -0.51, p=.609), intentional mindwandering (t(81)=0.30, p=.765), or unintentional mindwandering (t(81)= -0.17, p=.865); however these measures were limited in that they measured social attention to the group as a whole with the manipulated actor being just one team member.

Discussion

This chapter sought to shed light on the role of social attention in social decision making. The overall findings indicate that cue sampling failure does exist, consistent with bounded rationality (Simon, 1955, 1957). Further, results also found that the gender of social actors does bias decision making, however, not in the manner expected. First of all, there was no evidence for a difference in attention paid to male vs. female

social actors, although this could be due to methodological limitations discuss below. Second, and most strikingly, there was evidence that decision making was biased toward the information shared by women, not men, the inverse of what was expected. These findings and their implications are discussed below.

Cue Sampling Failure

This study provided the first evidence of cue sampling failure in social decision making, although the effect was modest. On average, participants failed to sample around 1 cue out of 6 or 7 available. This is slightly higher than expected based on past evidence that individuals mindwander up to 50% of the time (Killingsworth & Gilbert, 2010) and the general rhetoric about human's inattentiveness to the world (Dane, 2018).

This could be because individuals are particularly adept at processing social information, which would be logical given the importance of this process in human social life. Humans do show unique skills related to social processing such as our ability to quickly process faces (Barragan-Jason et al., 2012) and at an early stage of development (De Haan & Nelson, 1999). In other words, while in theory social attention is an incredibly challenging task, it could be that people have purpose "build" mental machinery for processing this form of information. This hypothesis cannot be examined using this dataset but is an interesting hypothesis for future research. However, an alternative explanation could be methodological. In this study cue sampling was judged based on participant's ability to recognize the correct six or seven statements said in the meeting out of a list of twelve statements, immediately after each decision scenario. This approach substantially reduced the cognitive demands on participants. This could explain why participants performed relatively well with over 50% of participants recalling all of the points shared by Focal Actor 2, getting a high as 74% in the maintenance decision. In order to address this, future research could increase the cognitive demands on the memory test for cue sampling. Perhaps the most appropriate way, which mirrors how individuals remember in the real world, would be to test memory using a recall task. Research has found that recalling information is more challenging then recognizing correct statements from a list (Raaijmakers & Shiffrin, 1992). Another method, which is again ecologically valid, would be to test participant memory/cue sampling at the end of

the meeting after all decisions were discussed. Both these approaches would likely reduce participants performance on cue sampling and also be more ecologically valid.

Irrespective of the size of the cue sampling failure this finding nonetheless has theoretical and practical implications for research on applied decision making. First, this research constructively challenges the lens model by identifying another process involved in decision making in applied settings (Brunswik, 1952; Karelaia & Hogarth, 2008). Specifically, prior to the cue weighting process described in the lens model, there is an attention-based cue sampling process. This sample process is not a novel concept and is largely consistent with both bounded rationality (Simon, 1955, 1957) and information processing model of decision making (Oppenheimer & Kelso, 2015b). However, when considered within the lens model framework it does have a number of important implications. First, it demonstrates that previous estimates of cue weighting based purely on analyzing participants decisions – e.g., through policy capturing studies – are erroneous because they make the incorrect assumption that all available information to the decision maker is processed in decision making. Therefore, an unsampled cue is analyzed as an unutilized/unvalued cue, which is not necessarily accurate. Second, by situating this research in the social domain, where information is transient and dynamic, we demonstrate that models of applied decision making based on non-social stimuli (e.g., written vignettes) might not map perfectly onto the same decisions made in social environments encouraging more social applied research on this topic.

More broadly, this research also provides a platform for future organisational research to build. Theoretically, the construct of cue sampling failure helps build a bridge between research on attention from the cognitive science, with work on applied social decision making in organisational science. As just one example, scholars could build theory integrating research on autism, which is linked with impaired social attention (Adolphs et al., 2001; G. Dawson et al., 2004; Katarzyna & Fred, 2010), into the organisational literature by demonstrating how this could impair decision making through cue sampling failure. Similarly, work could examine how an organisation environment - e.g., workplace design - could affect attention and thus have downstream effects on decision making. Given, the central role of decision making within

organisation (Cyert & March, 1963; Gavetti et al., 2007; Simon, 1947), this could provide a rich vein of research for management scholars to answer calls for research on attention in organisations (Dane, 2018; Meißner & Oll, 2019; Ocasio, 2011; Reb et al., 2020; van Knippenberg et al., 2015).

Gender Attention and Decision Bias

A primary goal of this chapter was to identify attention and decision bias related to gender. The central hypothesis was that men would receive more attention than women in the workplace and this would have downstream effects on decision making. However, analysis of the cue sampling data found no evidence for participants paying more attention to information shared by men than women. It is worth noting that because of the ceiling effects discussed in the previous section, this null result could be a type 2 error as there was not enough variance to detect and effect. However, there was evidence that if there was any bias in group information processing it was actually in favor of women and not men. This interpretation is based on the decision-making results. In the maintenance and location decision, participants got the correct answer around 70% of the time when the women shared the key information and 50% of the time when the man shared the information. This 20-point difference is a substantial decision bias. Therefore, it is plausible that without ceiling effects it could be possible that it is women receiving more attention than men in group settings, or at least that the information shared by women is judged equally to that of men.

This surprising result attracts theoretical speculation since it runs contrary to the prevailing view of gender within organisations (Bosak & Sczesny, 2011; Brescoll, 2011; Brescoll & Uhlmann, 2008; Heilman & Caleo, 2018): namely, that women are negatively stereotyped and ignored. Here we consider two promising avenues for research. The first draws on minority influence theory (Moscovici, 2012; Moscovici et al., 1969). Minority influence theory describes how minority groups can have a disproportionate effect on the broader society. It has been widely studied across the psychological sciences, from conformity experiments (Moscovici & Lage, 1976; Moscovici & Mugny, 1983) to research on how societal views can change as the result of individuals prominently challenging the status quo and has typically been applied in contexts related to social injustice (e.g., racial segregation and the suffragette movement) (Maass & Clark, 1984; R. Martin &

Hewstone, 2008). In this study, the woman was also a minority in the room and also had a relatively greater influence on decision making than a man. Therefore, it is possible that the same logic that has been applied to social change and macro level movements, also applied on the micro level to small group discussions. Drawing on cognitive psychology, this could also be the result of a pop-out effect (Kristjánsson et al., 2007; Wang et al., 1994), which is where stimuli that is different to the rest of the environment visually or auditorily stands out that thus receives additional attention. To test this extension of minority influence theory research could examine if other minorities (e.g., racial, or religious) also have a disproportional influence on decision making. If this theory is supported, then this would have implications for how we see team composition in organisations (Gruenfeld et al., 1996; Phillips et al., 2004). For example, in homogenous groups maybe we underestimated the effect that one diverse voice can have on the team and instead of being drowned out they actually rise to the surface.

A second possible explanation for why women have a greater influence on decision making comes from the social perception of women. Recalling Chapter 1 there was a notable finding that attention to candidate was more strongly correlated with perceptions of warmth than competence, a phenomenon termed "warm attention". Whilst this at first might seem surprising as one could expect that the quality of information is more important than the kindness of the person sharing the information, this finding is somewhat consistent with other work showing the important role of warmth in social judgement form others (Abele & Wojciszke, 2007; Wojciszke & Abele, 2008). Further, this is could also explain why women could have more influence in social situations as on average femininity is associated more strongly with warmth (Cuddy et al., 2008), in fact scholars have argued that warmth is the key social characteristic associated with femininity (A. E. Martin & Slepian, 2021). Supporting this theory would not only describe how women might have a greater influence in social situation but could be extended to a more descriptive and prescriptive model of how individuals influence social group.

Finally, the results of this study contrast the majority of organisational literature demonstrating gender bias, and anecdotes from business, such as Michelle Obamas amplification technique (Crockett,

2016). However, practically speaking, I would caution against viewing this as a bias against men that needs "fixing", and instead understand ways in which women can use this advantage to increase their impact in the workplace in light of the vast number of other challenges they face, such as in hiring (Isaac et al., 2009), pay (Blau & Kahn, 2003), and promotion (Bosak & Sczesny, 2011).

Social Decision Biases

The final point of consideration for this chapter is the discovery of social decision biases driven by the social demographics of a group. First, the fact that the same information said by a different social actor had an effect on decision making, to an extent this violates the normative assumption that all information should be treated equally irrespective of its source (Tversky & Kahneman, 1985), assuming that there is no substantive difference between men and women in terms of the quality of information they share (e.g. trustworthiness, insightfulness, etc.). Further, even beyond this, it demonstrates a new form of bias in decision making that is unique to the social domain. Whilst this effect is similar to the framing effect – where the same information is evaluated differently depending on whether it is semantically framed in a loss or gain frame (De Martino et al., 2006) – it is unique in that here the information being shared is exactly the same. Irrespective of the source of this bias, it identifies a new parameter to consider in social decision making and again provides a way to bridge research on the cognitive science of attention with work on judgment and decision making and more specifically organisational decision making.

This finding also has direct implications for the behavioural theory of the firm (Cyert & March, 1963), recently re-energized as the neo-Carnegie school of management (Gavetti et al., 2007). This macro theory is largely concerned with the process through which information search and decision making in organisations, placing this a critical determinant of firm success (Cyert & March, 1963; Simon, 1947). Therefore, the finding that the same information can lead to different decisions based on the characteristics of the social actor sharing the information, underlines the importance of integrating social cognitive, social psychological and more generally micro level research into this theory. In doing so, scholars could bridge the gap from the

micro and macro theories of organisational behaviour, making more progress toward a unified theory in management science.

Limitations and Future Directions

It is critical that this chapter is viewed in light of its limitations. First of all, this study is underpowered which draws caution to the study results. Therefore, future work should look to increase the sample size to have more robust estimates of the effect sizes. Nevertheless, the striking nature of the results, being in the reverse direction that hypothesized, does provide a strong challenge of the ex-ante theory. Second, the ceiling effects in the cue sampling measure severely limit the ability to draw strong conclusions from these null results. As suggested above, this could be addressed by increasing the cognitive demands of this memory task within the bound of ecological validity. Third, the effects on decision making were unique to the maintenance (hidden profile) and location (consensus) decision. Notably, these were the two decisions where there was a critical piece of information (critical cue in the maintenance decision and the initial sharing of the idea in the location decision), whereas in the advertising and clerks' decision the focus was on how participants would attend to multiple cues. Therefore, it is possible that the effects related to attention or decision bias are easier to detect if analyses are focused on one central cue. Finally, this research could be valuably extended examining how other social factors affect decision making, such as race, religion, charisma, and so on.

Based on the limitations describe above the future of this field is likely a research program exploring the parameters that affect social actor's influence in social decision making. Using the VR vignette approach this research can be conducted in a controlled manner that maintains psychological realism whilst also lending itself to direct replication. Through the systematic exploration of these different factors, researchers can then seek to develop higher level theories of how social factors influence social decision making.

Chapter Summary

This chapter sought to understand the role of social attention in decision making. Whilst the study is under powered and thus requires replication, the primary theoretical contributions of this chapter remain clear. First of all, the chapter demonstrates the important phenomenon of cue sampling failure, which is likely a key factor impairing social decision making. Second, this paper demonstrated that the social characteristics of group members (i.e., gender) can irrationally bias decision making, uncovering another critical process that can impair macro and micro level firm performance. Finally, and surprisingly, results found that information shared by women had a greater effect on decision making than the same information shared by men. This final point requires replication and theoretical explanation with two theories proposed for why women might have a larger effect on decision making: minority influence theory and stereotype content theory. Moreover, the more general observations concerning cue sampling failure and social decision biases can help develop new theory on the nuances of social information processing, which is pursued in the final section of this paper.

KEY FINDINGS & TAKEAWAYS

Cue Sampling Failure	Individuals in social environments do not sample all of the available information to them. Therefore, applied decision making is a function of individuals cue sampling (attentional process) and cue weighting (judgement process).
Gender Attention Bias	*No* evidence for a gender attention bias favoring men over women.
Gender Decision Bias	Information shared by women (vs. men) had a greater influence on decision making. This lead to a near 20% improvement in decision making in two out of the four decision scenarios.

Social Decision Bias	The same information shared by different social actors is weighted differently by social decision makers. This leads an irrational decision bias in how social groups make decisions.

CONCLUSION

Across three chapters this dissertation has advanced research on social attention within organisations. Each of these chapters operate as stand-alone investigations and for summaries of each please see the "chapter summary" section at the end of each chapter. This final conclusion strives to accomplish three goals. First, a brief summary of results across the three studies is provided for a time-strapped reader not able to read all three chapters in depth. Second, the findings of this paper are inductively integrated into a new theory of social attention within organisations, moving from the specific observations detailed in the chapters to broad generalizable statements relevant to organisations. Third, this new theory is used to pave a way for future research topic that could advance the field.

Executive Summary

This dissertation opened by asking three questions:

1. *How do we measure social attention in realistic work environments?*

2. *Do certain social actors receive more (or less) social attention?*

3. *How does an inefficient allocation of attention to social actors, impact information processing and decision making within organisations?*

The first question was addressed in chapter 1. This chapter identified VR as a method for studying social attention that provides researchers with a balance of experimental control (needed to make causal inference) and realism (needed to maintain ecological validity). By using this approach, measures of social attention were found that demonstrated criterion, divergent, and convergent validity (Colquitt et al., 2019; Hinkin, 1998). These measures included psychometric scale and thought probes. Unfortunately, eye-tracking metrics for time spent looking at social actor and number of fixations to a social actor were not seen to be a valid measure, however, given the novelty of this measure it is highly encouraged that future scholars seek to use more rich approaches in analyzing eye-tracking data in order to develop valid objective measure of social

attention. In sum, the informed answer to the first question is: In virtual reality using psychometric scales and/or thought process.

The second question was best addressed by Chapter 2. Using charisma as a low-hanging fruit, this chapter found evidence that charismatic job candidates received more attention in job interviews. This was demonstrated using both psychometric scales and thought probes, with the longitudinal thought probe data showing that charismatic individuals received increased attention during the middle portion of the interview (see Figure 10). However, in another test of this question conducted in Chapter 3, there was no evidence that individuals paid more attention to male or female individuals in a decision-making meeting. This could be attributed to ceiling affects in the cue sampling data and/or the failure to accurately measure selective attention to the focal actor, both discussed in Chapter 3. In sum, the informed answer to the second question is: yes, charismatic individuals attract more social attention than non-charismatic individuals.

The third question was addressed in Chapter 3. This chapter manipulated the gender of a focal actor in a decision-making team and found that whether this actor was male, or female "irrationally" affected decision-making leading to sub-optimal choices. Surprisingly, against the chapter's hypotheses, it was found that information shared by women have a greater effect on decision making and credit allocation than information shared by men. However, as mentioned above, this social decision bias favoring women was not complimented by an attention bias favoring woman. In sum, a partial answer to the third question is provided: yes, the characteristics (gender) of a social actor does affect information processing and decision-making within organisations, however, no, this cannot (yet) be attributed to difference attention allocation to these individuals.

These summaries provide the answers to the major questions asked but, as if often the case, in pursuit of these answers unexpected findings also arose that could excite future research. These findings are summarized in the "Key Findings & Takeaways" box at the end of each chapter. The majority of these findings arose in Chapter 1 as it was the least driven by specific hypotheses. These include 1) the boomerang nature of social attention, which found that social attention is most present in the beginning and end of an

interview/social interaction but wanes in the middle, 2) warm attention, the finding that warmth (more than competence) is associated with receiving social attention providing a more generalized answer to Question 2, and 3) that autistic individuals show impaired social attention and cue sampling that inevitably affects downstream work behaviour. These unexpected results are indicative of an emerging field and hopefully attracts more scholars to the study of social attention.

Finally, taking a bigger picture perspective, this dissertation has been able to pick up the mantle set by Herbert Simon (p507-508, 1979) by investigating the "social-psychological factors that enter into the decision process in organisations". This helps extend the micro-level propositions of the behavioural theory of the firm to compliment the macro-level work on this topic (for reviews see Argote & Greve, 2007; Gavetti et al., 2007, 2012). It is now my hope that this dissertation can spur on more empirical investigation of these micro-foundations of attention within organisations and in a final bid to do so, this next section attempts to synthesize the knowledge from across these chapters into a new (attention-based) theory of socially bounded rationality.

A Theory of Socially Bounded Rationality

The theory developed in this section builds largely on the behavioural theory of the firm and particularly the work of Herbert Simon (1947; 1955; 1956; 1957). One of the most impactful ideas developed in organisational science is that of bounded rationality[h]. Bounded rationality is the idea that individual's limited cognitive capacity (bounds) prevents them from making optimal (rational) decision (Simon, 1957). This results in individuals making decisions that are satisfactory and sufficient within these bounds, i.e., satisficing (Simon, 1947, 1956). Within the behavioural theory of the firm, bounded rationality is an underlying psychological explanation of why firms do not make optimal decisions, which explains

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[h] To understand the impact of this idea, of the three Nobel prize winners in economics who were not trained or teaching as economists, all of them won the prize for work on or theoretical extensions of the bounded rationality idea (Herbert Simon, Daniel Kahneman, & Richard Thaler).

organisational failures (Simon, 1947). This then also gives rise to theory based on how organisations manage their employee's bounded rationality, such as work on routines (Gavetti et al., 2007, 2012) and the attention-based theory of the firm (Ocasio, 1997).

Bounded rationality has been a particularly impactful idea in the field of judgement and decision making. The heuristics and biases paradigm, championed by Daniel Kahneman and Amos Tversky (1974), started the process of identifying specific cognitive biases resulting from individuals inherent bounded rationality. The list of biases has greatly proliferated over the past 50 years, and numerous organisational papers have been written on the role of these biases in organisations and methods to ameliorate them (Morewedge et al., 2015; Sellier et al., 2019; Yoon et al., 2021). Ultimately, all these biases focus on how individual's ability to process information is cognitively limited and thus results in biases in decision making (Simon, 1955). Attention is a particularly critical part of this process as it is by nature restrained to focus on one piece of information at a time, leading to heuristic search processes (Gavetti et al., 2007; Simon, 1947). However, this research focuses on attention to non-social information, e.g., written vignettes or decision problems. In these scenarios the information is clearly accessible, stable and thus researchable, and generally objective (meaning it is not coming from a person's "point of view). As reiterated throughout this dissertation, this is not the case for social information. This theory addresses how the nature of social interactions add another layer of complexity (and bounded rationality) to applied *social* decision making.

Social interactions are the communications between two or more social actors. They are a primary form of information transfer (i.e., communication) within organisations. As chapter 1 described, social information is dynamic (constantly changing), transient (available for short periods of time), and temporally structured. Social attention is the process by which individuals select information from this interaction to process. This dissertation showed that the nature of social interactions mean that individuals cannot attend to all information (cue sampling failure; see chapter 2 and 3) and that attention varies across the time period of an interaction (boomerang attention; see chapter 1). However, whilst these two processes are likely amplified in social interactions, they are both processes that occur with non-social information, e.g., people

can forget to read a segment of text and attention can wax and wane during reading. Therefore, this theory focuses on a more central characteristic of social information that makes it qualitatively distinct to non-social information. This characteristic is that *social information is embedded within social actors*.

Information that is transmitted socially is communicated by social actors who each have their own social characteristics and demographics. This process of embedding means that information is not just processed based on the content of the information but also on the social perception/evaluation of the person sharing the information. This adds another (social) dimension to the transfer of information. This contrasts non-social information that is typically communicated through written form, such as text, numerically, and/or pictorially. In this dissertation, the important role of this social embedding process has been elucidated. Using virtual reality, individuals were situated in social environments and information was communicated to them via social actors. What was manipulated was not the information being shared, as is typically done when studying cognitive biases (e.g., the frame or the anchor; De Martino et al., 2006; Mussweiler et al., 2004), but the characteristics and demographics of the social actors.

Results from this dissertation showed that the demographics and characteristics of a social actor can affect how social information is processed. The charisma-based attention capture phenomenon, shown in chapter 2, demonstrates that judgements of individuals sharing identical information can vary based on the social characteristics (non-verbal behaviour) of the social actor sharing the information. The gender-based decision bias phenomenon, shown in chapter 3, similarly demonstrates that the influence information has on decision making is affected by the gender of the social actor sharing the information. Further, and more generally, there is evidence across the chapters for warm social actors attracting social attention – "warm attention" – suggesting that this might be a core social perception biasing social information transfer. Further, building on chapter 1 and 2, social attention appears to be as particularly important cognitive process in determining how social information is processed.

By altering how information is processed, the social embedding of data also leads to biases in judgment and decision making. Similar to how individuals limited cognitive capacity leads to satisficing in

cognition (Schwartz et al., 2011; Simon, 1956), this same process leads to individuals in the social domain to selectively process information from certain social actors over others. If we were to call this prior process "cognitively bounded rationality", we can then term this latter process "socially bounded rationality". Critically, whilst these two processes are both downstream consequences of individual's cognitive limits, they are distinct processes occurring at different levels of analysis (See Figure 12). In social interactions these two levels are 1) the information level where each piece of information shared is represented as a separate "bit", and 2) the social-actor level where these "bits" of information are embedded into social actors. Cognitively (i.e., traditional) bounded rationality occurs at the level of information, altering how we sample, retrieve, and integrate information (Oppenheimer & Kelso, 2015). Socially bounded rationality occurs at the social-actor level, with each social actor having their own demographics and characteristics. Biases in processing can then occur at each of these levels of processing, and theoretically even interact with each other. Importantly, whilst the information level is termed cognitive, and the social-actor level is termed social, both biases are the result of cognitive processes, the distinction is that the prior is strictly cognitive whereases the latter can be termed socio-cognitive.

The critical implication of socially bounded rationality for organisations is similar to that of traditional bounded rationality, it leads to sub-optimal (irrational) decision making. The rational decision-making model predicts that individuals will maximize expected utility in decision making. An assumption of this model is that given identical information, decision makers will arrive at the same decision (Tversky & Kahneman, 1985). Traditional bounded rationality showed that humans violated this assumption in the framing effect, where the presentation of information as a loss or gain frame altered decision making (De Martino et al., 2006). Similarly, chapter 3 demonstrated that the gender of the social actor sharing information – even if that information is identical in content and framing – can bias decision making leading to more sub-optimal/irrational behaviour when critical information was shared by a man vs. woman. Within the behaviour theory of the firm (Cyert & March, 1963; Gavetti et al., 2007, 2012), this then demonstrates how socially bounded rationality can lead to firm failure through impairing decision making.

Socially bounded rationality is particularly relevant to organisations which are by nature social

entities. Considering the role that the social embedding of information has on decision making, organisations

are presented with another dimension through which information processing within their company can be

significantly altered. Unlike formalized routines that can be consciously implemented by managers, i.e.,

"attention-directors" (Argote & Greve, 2007; Gavetti et al., 2007), these social drivers of attention are

invisible structures that operate within organisations an determine the flow of information from the lowest

level of the organisation (e.g., informal chats between colleagues) to the highest levels (e.g., boardroom

meetings). Further, these socially bounded rationality also contributes to the organisational anarchy

described by the garbage-can model of group decision making as not only is their problems, solutions, and

decision makers being pumped into group decisions (Cohen et al., 1972) but, each social actor also brings

their own unique mix of demographics and characteristics into the conversation. In sum, socially bounded

rationality is another consequence of human's limited cognitive capacity that biases organisational decision

making and can lead to firm failure, making it a theoretically and practically relevant topic for organisational

behaviour.

Socially bounded rationality can be seen as a problem for organisations, but it can also be seen as an

opportunity for individual social actors. Similar to how marketing has exploited the cognitive biases in human

decision making to increase sales, individual social actors can exploit socio-cognitive biases to increase their

influence on a group. Chapter 2 highlighted this by showing that charismatic individuals – a characteristic that

can be trained (Antonakis et al., 2011) – can capture more of their audience's attention. In interviews this can

be used to amplify the positive judgement you receive, but more broadly it can be used to increase one's

social influence in a group or nudge group decision making in one's favor. This exploitation is not necessarily

always a force for bad, and just likely any other form of influence it can be used by leaders or other social

actors to rally people and motivate them toward mutually beneficial goals.

In sum, this section introduced a theory of socially bounded rationality. This theory is an extension of

bounded rationality and argues that along with cognitive biases occurring on the information level, there are

also analogous socio-cognitive biases that emerge on the social actor level (see Figure 12). These biases exists because in social interactions, all information is embedded within social actors whom each have their own characteristics and demographics. Due to human's inherent cognitive limits, this dissertation has repeatedly shown that these characteristics and demographics are used by individuals to determine how they attend to, and process information shared by social actors, giving rise to *socially bounded rationality*. Akin to traditional bounded rationality, this then leads to downstream biases in decision making. The decision of organisations as a whole, which are often social, are thus meaningfully altered by this socially bounded rationality and individuals within organisations can (and likely do) use these biases in social-cognitive to increase their own influence.

This theory is in itself can be considered part of a micro-level attention-based theory of the firm. This contrasts the majority of attention research in the management sciences that focuses on the role of attention in strategy at the organisational level (Cyert & March, 1963; Ocasio, 1997). Whilst this macro-level perspective is valuable, given the inherently micro-level nature of attention, it is important that these are grounded in individual level processes (Ocasio, 2011). The final section of this dissertation considers how this theoretical framework can be extended to provide a richer view of how attention operates within firms on an individual level, and how this can be integrated with macro-level theories of attention.

Figure 12

Model of socially bounded rationality describing how bias can emerge on two separate levels of analysis: the information level (below) and the social actor level (above).
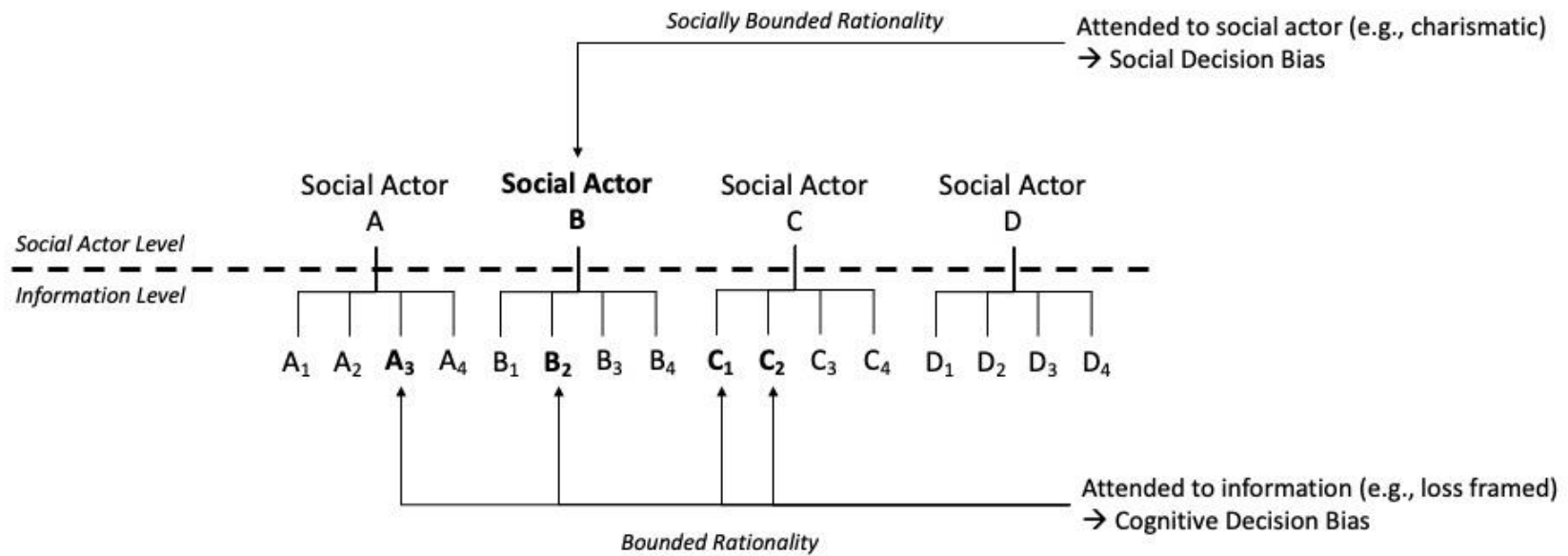
Future Research

With research on social attention in organisations in its infancy, there are a great deal of avenues to explore. These sections will focus on how research on social judgement and decision can be advanced by investigating socially bounded rationality, but this is primarily to keep the focus on this paper succinct. Nevertheless, it is also strongly encouraged for research to investigate the role of attention in the myriad of organisational processes in which it is relevant. Including but not limited to, leadership (e.g., how leaders capture and direct follower's attention), performance (e.g., how different forms of attention – focused attention and monitoring – play a role in performance), emotion (e.g., how emotional states guide attention and vice versa), and ethics (e.g., how we pay attention to perpetrators and victims during injustice episodes). Virtual reality vignettes can be used as a tool to explore all these different research questions and with validated measures this field can begin making important strides. However, putting these research avenues to the side, this section considers how research on social attention can be advance through examining socially bounded rationality.

The concept of socially bounded rationality provides a novel angle for understanding organisational decision making in groups, but there are also vast literatures that this research can be integrated with. Similar to how psychologists had been studying human cognitive limitations long before the idea of bounded rationality was introduced (James, 1890; Von Helmholtz, 1867), organisational scholars have also studied the social dynamics of influence (Cialdini, 1987; Cialdini & Goldstein, 2004), and scholars in communications have studied how individuals use language to express themselves and persuade others (Mulholland, 2003; Ottati & Renstrom, 2010), both of which are relevant for work on socially bounded rationality. Therefore, the field could begin by integrating these literatures, so as to avoid reinventing the wheel.

Socially bounded rationality posits that there are biases in how individuals process social information based on the characteristics and demographics of the social actor sharing the information, therefore, a logical first step is to first build a map of what these biases are. This is a similar approach to that followed in research on bounded rationality with the heuristic and biases research program (Gilovich et al., 2002)

identifying a huge number of cognitive biases in judgment and decision making, along with developing methods for ameliorating these biases (Morewedge et al., 2015; Sellier et al., 2019; Yoon et al., 2021). A similar approach with socially bounded rationality would seek to understand what characteristics and demographics operate to capture other's attention. This dissertation examined gender and charisma, future research could examine demographics such as race and age along with characteristics such as personality and trustworthiness. Identifying specific biases is an important process, however, the goal for the field is that these would contribute to overarching theories on what captures attention. One such idea arising from this dissertation is "warm attention", which is the idea that warmth (over competence) is a key social judgment that attracts attention from others. This could be because warm people are seen as trustworthy and thus their information is reliable, but it could also just be the result of the hedonic principle (Higgins, 2006): listening/interacting with warm individuals makes us feel good and we are motivated to feel good. This theory would need intense scrutiny, but evidence support it would be valuable informing the map of how socially bounded rationality affects social information processing and also in applying this theory practically to organisations.

However, whilst identifying the biases in human judgement and decision making is important, research on socially bounded rationality doesn't want to fall into the trap of hyper-focusing on the negative side of these biases. A tenant of evolutionary psychology is that biases in cognition have evolved because they provided a survival advantage to our ancestors (Barkow et al., 1995; Cosmides & Tooby, 1987). Therefore, it is likely that each bias serves an evolutionary purpose and is thus optimal in certain environments. Certainly, the attention system is limited, but is also remarkable how well it functions given these limitations. Just taking a look around your room and remembering you're your brain can only attend to one piece of information at a time shows you how effectively your brain is able to create the illusion of a stable world out of these measly cognitive tools (Blackmore et al., 1995). Again, research on socially bounded rationality can use past research on bounded rationality as a guide. The heuristic and biases paradigm (Gilovich et al., 2002), has been criticized for overly focusing on the failures of human decision making and

not appreciating when heuristic search processes actually make decision making fast and effective. In response to this, the fast and frugal heuristics paradigm has started identifying the utility of heuristics and helped changed the negative narrative in the literature (Gigerenzer et al., 2011; Gigerenzer & Todd, 2001; Luan et al., 2019). Therefore, research on socially bounded rationality could start by adopting a balanced perspective, understanding how biases in social information processing can lead to irrational behaviour and suboptimal decision making but equally considering how these same biases might be highly functional in specified environments. Such an approach would again be consistent with the work of Herbert Simon (1947) whose famous scissor analogy explains how biases based on regularities in the structure of an environment (one blade of the scissors) can make up for human's cognitive limitations (the other blade of the scissors).

Another direction for future research would be to extend the theory of socially bounded rationality. In its current form, the theory focuses on how social information is embedded within social actors. However, this only distinguishes between two levels of analysis. Future research could broaden the theory to higher levels of analysis. For example, social actors are also embedded within social networks. In other words, within social interactions certain individuals might be from one's own network and others could be from a different network. The positioning of an individual within a network could affect how individuals process social information and thus be another source of bias.

This process of aggregation to a higher level highlights an ultimate goal for research on socially bounded rationality, providing a theory that can link both micro and macro-organisational theory. Certainly, socially bounded rationality has its roots in micro processes such as attention and decision making, however, by describing how information flows around an organisation, this work has clear ramifications for macro-organisational processes. This is particularly apparent within the behavioural theory of the firm, which socially bounded rationality is logically an extension from. The behavioural theory of the firm provides a macro level argument for the role of attention in organisations and also concepts that aggregate from the micro to macro level (Cyert & March, 1963; Gavetti et al., 2007, 2012), e.g., the individual level idea of bounded rationality aggregates to organisation level idea of routines. Further, and most importantly, by

specifying the role of the firm as an information processing machine geared toward decision making, this theory also provides a framework through which these lower-level cognitive processes can meaningfully affect an entire firm's behaviour. Therefore, by fitting socially bounded rationality within this framework, scholars could develop theory on how the social make up of organisations (i.e., employees characteristics and demographics, along with the social network structure) can be quantified on an organisational level and then used to examine how variation in these factors determines organisational outcomes such as corporate social responsibility, performance, and firm-level well-being.

Concluding Remarks

This dissertation has delved into the weird and wonderful world of social attention. It leaves the field with a method to study social attention, some empirical findings on how attention operates within organisations, and an inductive theory of how the nature of social interactions alters judgement and decision making within organisations. It has been an absolute pleasure to research and write, bringing a touch of sadness as these last words are written. For anyone who made it this far I am extremely grateful for your attention (though I can't promise it was optimally allocated) and I hope it spurs you on to consider the role social attention plays in your own life whether that is in research or not. To conclude, I will leave you with a haiku:

Our beautiful world,

Is birthed in every moment,

By your attention

ACKNOWLEDGEMENTS

There is little to distinguish this section "acknowledgements" and the following section "references", except that the contributions of the latter are noted throughout the dissertation, and the contributions of the prior exist in the spaces between the words. Therefore, it is true, I couldn't have written the words in this dissertation without my references, but I wouldn't have the blank sheet of paper in front of me if it wasn't for my acknowledgments. And, you will notice, that there is far more blank space than there are words in this dissertation.

It is fair to say I wouldn't be able to physically write these pages if it weren't for the extensive support I received as a child, from my dyslexia tutors. Judith Jenkinson, Jane Ireland, and Jan Howard, to this day and into the future I apply the techniques and strategies you taught me. I may still not know exactly what a sentence is, or the difference between passive and active tense, but thanks to you (and somehow despite all of that) I have loved writing every page of this dissertation. For this, I am ferociously grateful to you three teachers.

Behind all teachers there is also a teaching assistant, someone putting in the hard work on a daily basis. This has always been my mother. Reading countless pages of my gibberish and tirelessly correcting each sentence. It is hard to ever quantify or visualize the hidden force of motherhood, but like tectonic plates, they move and shift in the background creating structures that look like they have been there forever. You even proofread this acknowledgement, so obviously your work is far from done.

There is also a lot of genes in this dissertation. I feel fortunate to have come from a family seeped in academia. My father, brother, grandfathers (Chuck & Karl), great grandfathers (Verner), aunts (Carlie), uncles (Jon & Rick), great uncles (Eric), and cousins have all paved the way for me to think critically and deeply about the nature of our world. In particular my father. From the time of my birth his challenges and critiques to my never-ending stream of questions

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have always kept me on my toes. Yet, it is not until now that I realize all these rebuttals were just providing me with a hard surface to sharpen my mind on. In the years of my PhD, you then also provided soft space to rest a tired mind.

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TABLES AND FIGURES

Tables

Table 1

Articles published in leading management journal focusing on the role of attention.

Article	Journal
Eklund & Mannor, 2021; Haas et al., 2015; Kaplan, 2008; Li et al., 2013; Piezunka & Dahlander, 2015; Shim et al., 2021; Stanko & Beckman, 2015; van Knippenberg et al., 2015; Zhong et al., 2021	*Academy of Management Journal*
Hollenbeck et al., 1995; Reynolds, 2008	*Journal of Applied Psychology*
Leroy, 2009; Leroy & Schmidt, 2016; Overbeck & Park, 2006	*Organisational Behaviour and Human Decision Processes*
Leroy & Glomb, 2018; Nicolini & Korica, 2021; Woolley et al., 2022	*Organisation Science*
D'Aveni & MacMillan, 1990; Hansen & Haas, 2001; Reschke et al., 2018; Vuori & Huy, 2016	*Administrative Science Quarterly*

Note. This literature search does not include papers on mindfulness. Whilst mindfulness is an attention-based practice it is also often studied as a mixed construct having dimensions related to acceptance and non-judgement. Nevertheless, there is the capacity for mindfulness research to have a stronger focus on attention as seen in the psychological literature in which purely attention-based effects are hypothesized and tested (e.g., Jankowski & Holas, 2020; Jha et al., 2007; Mrazek et al., 2012; Schofield et al., 2015).

Table 2. Criterion Validity

Table indicates correlation between measures of social attention and performance on the memory (recognition) task. Colors indicate whether the measures is self-report (blue), thought probe (green) or eye tracking (red).

Measures of Social Attention	Mean	SD	Correlation with Memory
General Attentiveness	5.30	1.13	0.25***
General Inattentiveness	4.07	1.12	0.23***
Mindwandering (Intentional)	3.70	1.34	0.23***
Mindwandering (Unintentional)	3.95	1.42	0.2***
Selective Attention to Candidate	5.60	0.97	0.13*
Selective Attention to Interviewer	3.17	1.49	-0.13*
Probe Caught Mindwandering	3.11	2.57	-0.17***
Probe Caught External Attention	12.14	3.82	0.13*
Probe Caught Internal Attention	6.66	3.50	0.01
Number of Fixations	202.35	60.33	0.03
Total Gaze Duration	405.58	111.82	-0.02

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 3. Divergent Validity

Table indicates correlation between measures of social attention and related but distinct constructs. Colors indicate whether the measures is self-report (blue), thought probe (green) or eye tracking (red).

Measures of Social Attention	Valence	Arousal	Warmth	Competence	Attractive
General Attentiveness	0.32***	0.31***	0.35***	0.22***	0.17**
General Inattentiveness	-0.11	-0.31***	-0.20***	-0.07	-0.04
Mindwandering (Intentional)	-0.01	-0.25***	-0.18**	0.00	0.01
Mindwandering (Unintentional)	-0.10	-0.29***	-0.18**	-0.01	0.02
Selective Attention to Candidate	0.29***	0.25***	0.34***	0.15*	0.23***
Selective Attention to Interviewer	0.09	0.11	0.06	0.04	-0.05
Probe Caught Mindwandering	-0.26***	-0.26***	-0.35***	-0.24***	-0.16*
Probe Caught External Attention	0.15*	0.05	0.35***	0.23***	0.11
Probe Caught Internal Attention	0.03	0.12	-0.11	-0.07	0.00
Number of Fixations	-0.04	-0.01	0.02	0.03	0.04
Total Gaze Duration	0.02	-0.07	-0.03	-0.02	-0.04

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 4. Convergent Validity

Table indicates correlation between measures of social attention. Colors indicate whether the measures is self-report (blue) or thought probe (green).

Measures	1	2	3	4	5	6	7	8
1. General Attentiveness	-							
2. General Inattentiveness	-0.40***	-						
3. Mindwandering (Int)	-0.34***	0.66***	-					
4. Mindwandering (Unint)	-0.43***	0.69***	0.64***	-				
5. Attention to Candidate	0.59***	-0.37***	-0.30***	-0.32***	-			
6. Attention to Interviewer	0.05	0.00	-0.03	-0.02	-0.10	-		
7. Mindwandering	-0.58***	0.45***	0.36***	0.41***	-0.42***	-0.09	-	
8. External Attention	0.16*	-0.23***	-0.20**	-0.23***	0.19**	0.06	-0.42***	-
9. Internal Attention	0.27***	-0.08	-0.06	-0.06	0.11	-0.03	-0.27***	-0.75***

Note, eye-tracking measures are omitted as they didn't show criterion validity.

* p < .05, ** p < .01, *** p < .001

Table 5.

Descriptive statistics and correlations for all of the Study 2 variables.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Charisma Condition	0.50	0.50	-									
2. Quality Condition	0.51	0.50	-.02	-								
3. Generalized atten.	5.30	1.13	.12*	.00	(0.95)							
4. Generalized inatten.	4.07	1.12	-.12*	.02	-.40***	(0.72)						
5. Mindwander (int)	3.70	1.34	-.06	.03	-.34***	.66***	(0.77)					
6. Mindwander (unint)	3.95	1.42	-.12*	.00	-.43***	.69***	.64***	(.85)				
7. Probe Caught (MW)	3.11	2.57	-.28***	.03	-.58***	.45***	.36***	.41***	-			
8. Probe Caught (int)	6.66	3.50	-.03	.04	.27***	-.08	-.06	-.06	-.27	-		
9. Probe Caught (ext)	12.14	3.82	.22***	-.06	.16*	-.23***	-.20**	-.23***	-.42***	-.75***	-	
10. Cue Sampling	8.39	2.30	.07	-.03	.25***	-.23***	-.22***	-.23***	-.17*	.13*	.01	-
11. Candidate Rating	5.72	2.19	.32***	.32***	.23***	-.08	.01	-.02	-.28***	-.05	.26***	-.01

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 6.

Descriptive statistics and correlations for all of the Study 3 variables.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1. Condition	0.47	0.50	-										
2. Ad. Decision	0.24	0.43	0.09	-									
3. Main. Decision	0.59	0.49	-0.25*	0.01	-								
4. Clerks Decision	0.52	0.50	0.03	-0.03	-0.01	-							
5. Loc. Decision	0.41	0.49	-0.20†	0.05	0.20†	0.01	-						
6. Generalized Attention	5.28	1.13	-0.06	0.03	0.10	0.02	0.30**	(0.96)					
7. Mindwandering (Int)	3.37	1.35	0.03	0.01	0.02	0.15	-0.08	-0.22†	(.80)				
8. Mindwandering (Unint)	4.24	1.47	-0.02	-0.17	-0.08	0.05	-0.06	-0.22†	0.39***	(.87)			
9. Competence (Team)	5.80	1.10	0.03	-0.04	0.14	0.15	0.00	0.33**	-0.14	-0.16	(.94)		
10. Warmth (Team)	5.31	1.39	-0.02	0.08	0.17	0.18	0.00	0.38***	-0.14	-0.11	0.55***	(.94)	
11. Age	23.52	5.00	0.14	-0.21†	-0.15	-0.20†	-0.05	0.15	-0.16	-0.15	-0.05	-0.04	-
12. Female	0.67	0.47	0.09	-0.03	-0.11	0.00	-0.01	-0.11	0.00	0.10	0.06	0.06	-0.31

Notes. Coding of variable as is follows: condition (1 "White Male"; 0 "White Female); Ad./Main./Clerks/Loc. Decision (1 "correct"; 2 "incorrect. †p < .10, * p < .05, ** p < .01, *** p < .001

Table 7.

Summary of t-tests run in Chapter three to examine decision and attention (cue sampling) bias. Cue sampling is the number of cues remembered from Focal Actor 2 (gender manipulated), and cue rating is the importance rating of cues shared by Focal Actor 2.

Dependent Variable	Male Condition	Female Condition	t-value	p-value
	Mean (SD)	Mean (SD)		
Decision Making				
Advertising Decision	.28 (.46)	.20 (.41)	0.82	.416
Clerks Decision	.54 (.51)	.51 (.51)	0.24	.811
Maintenance Decision	.46 (.51)	.70 (.46)	-2.29	.025
Location Decision	.31 (.47)	.50 (.51)	-1.79	.077
Cue Sampling				
Advertising Decision	2.28 (.79)	2.41 (.79)	-0.73	.467
Clerks Decision	3.46 (.76)	3.34 (1.01)	0.60	.544
Maintenance Decision	1.67 (.54)	1.73 (.58)	-0.49	.624
Cue Rating				
Advertising Decision	3.46 (.72)	3.40 (.66)	0.38	.704
Clerks Decision	3.82 (.85)	3.67 (.94)	0.74	.464
Maintenance Decision	3.82 (.91)	4.05 (.72)	-1.25	.213

Figures

Figure 1

This is a model based on Information Processing Theory combining the Atkinson and Shiffrin Model (1968) and the Baddeley and Hitch Model of Working Memory (1974).
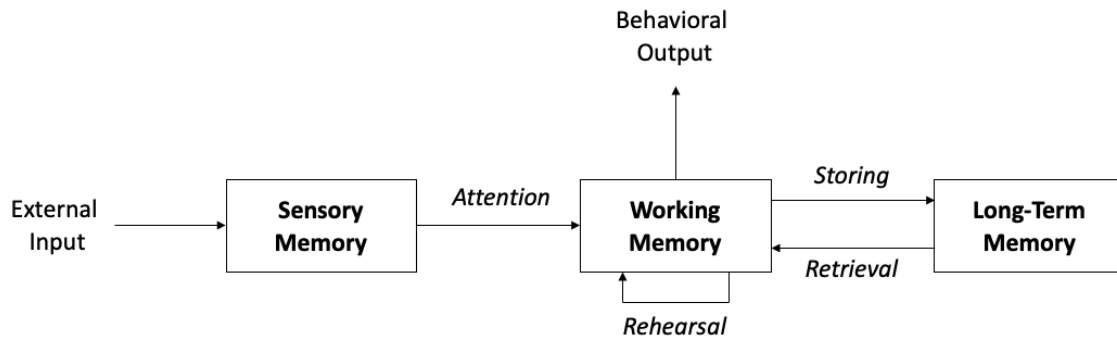
Figure 2

These images represent the challenges faced by individuals with hemi-spatial neglect. The first is a patient shaving, the second a patient drawing a clock, the third a patient copying a house.
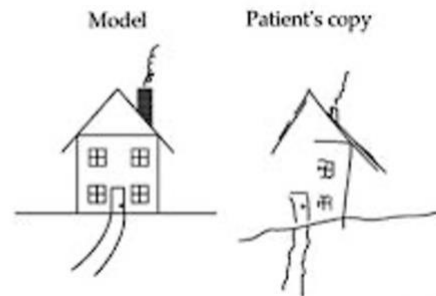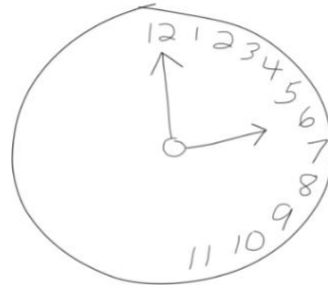
Figure 3

This diagram depicts a job interview with an observer viewing a job candidate an interviewer. The observer has a choice whether to selectively attend to the 1) the candidate, 2) the interviewer, or 3) pay attention to neither (i.e., inattention). The possible directions of attention are marked with two sets of dotted lines.

Candidate
Information = C_n

Attention

Inattention
Information = X

Observer
(Participant)

Interviewer
Information = I_n
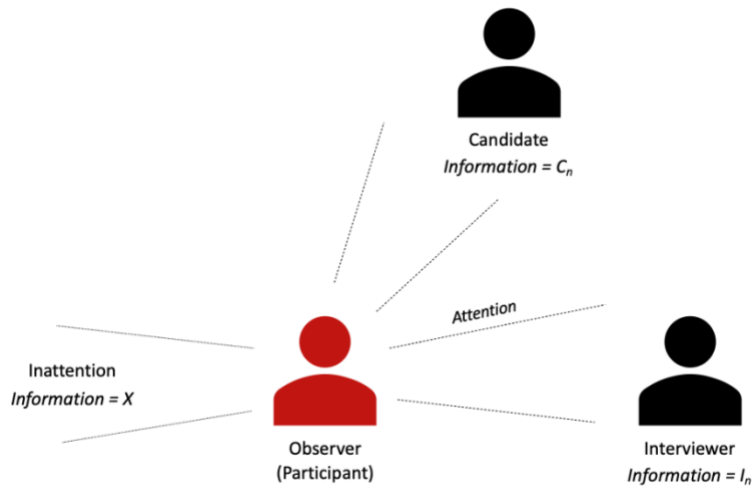
Figure 4

The graph below depicts the realism-control trade off (Fox et al., 2009). The graph also demonstrates the advantage of using VR in maximizing both control and realism.
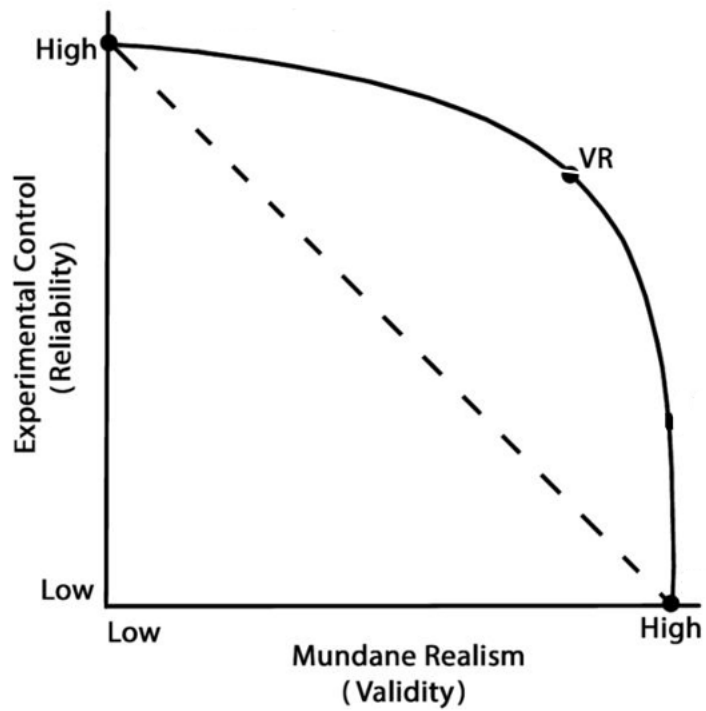
Figure 5

Relationship between mindwandering and time (# number of probe). Results demonstrate the "boomerang" nature of social attention, with mindwandering being lowest at the start and end, but highest in the middle. Note, an inverted graph can be plotted by putting "externalized attention" on the y-axis that is also significant, however, given that mindwandering performed better in the validity tests, this relationship is provide.
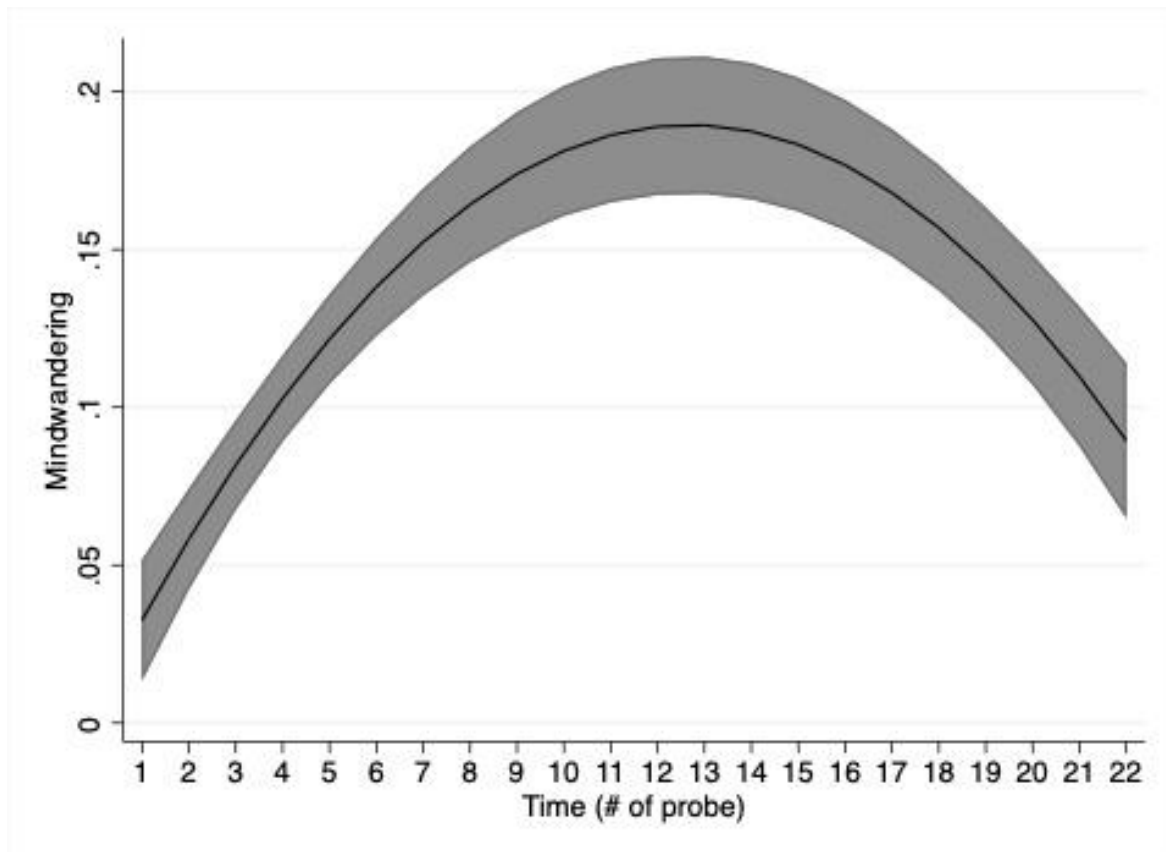
Figure 6

An adapted version of the Brunswick Lens Model.
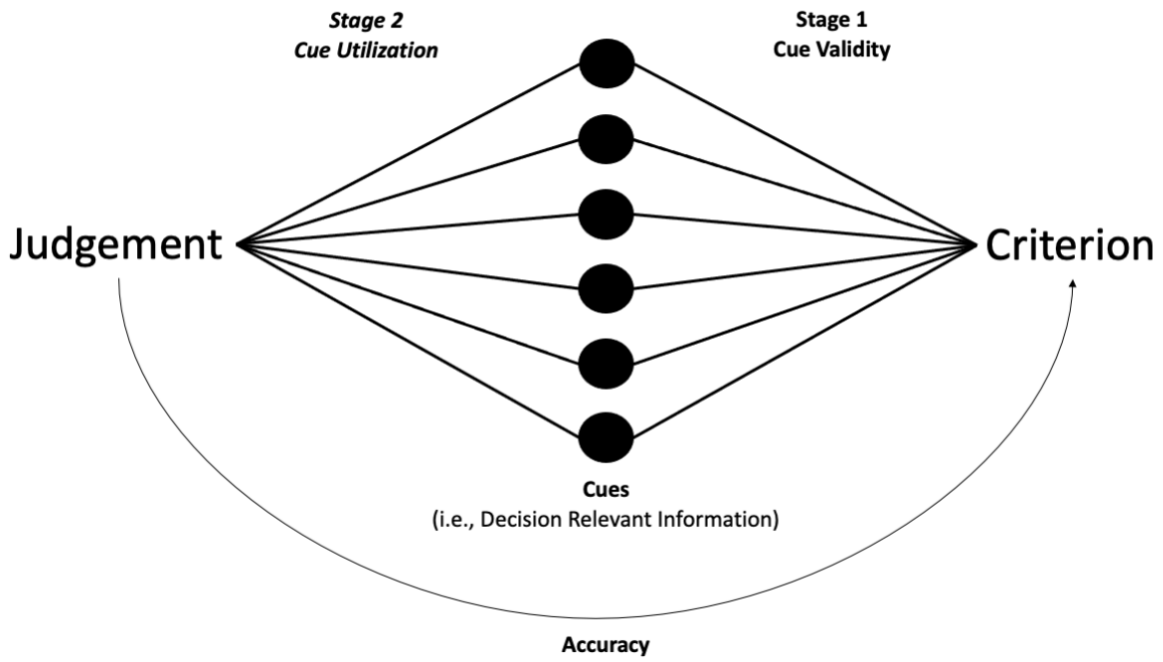
Figure 7

The Lens model with two cues not being samples, i.e., a sampling failure.
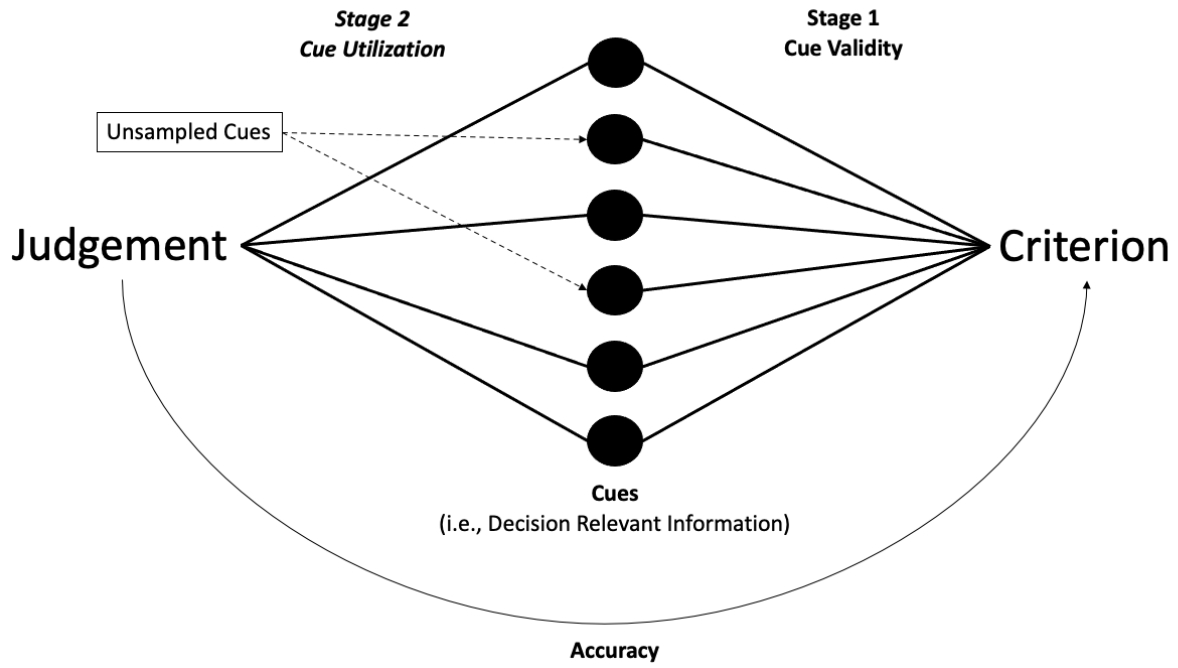
Figure 8

This diagram illustrated the competition for attention. The concept of *attention capture* is demonstrated across a continuum from those who capture a high degree of their audience's attention to those who capture a miserly amount.
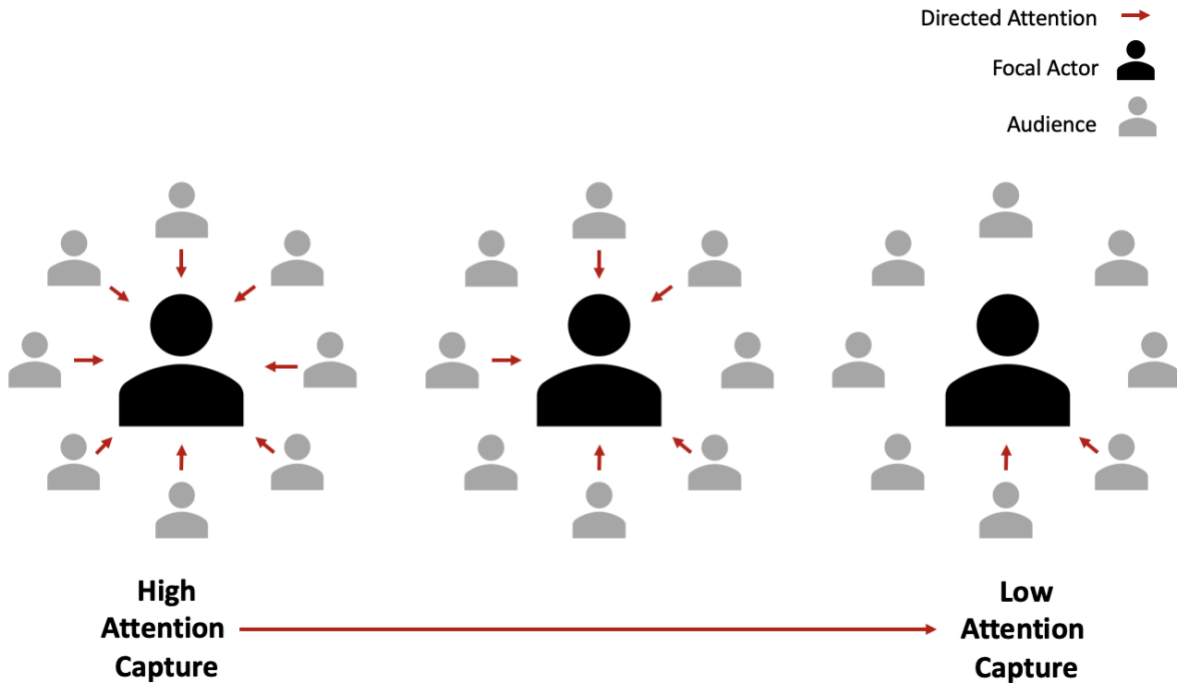
Figure 9

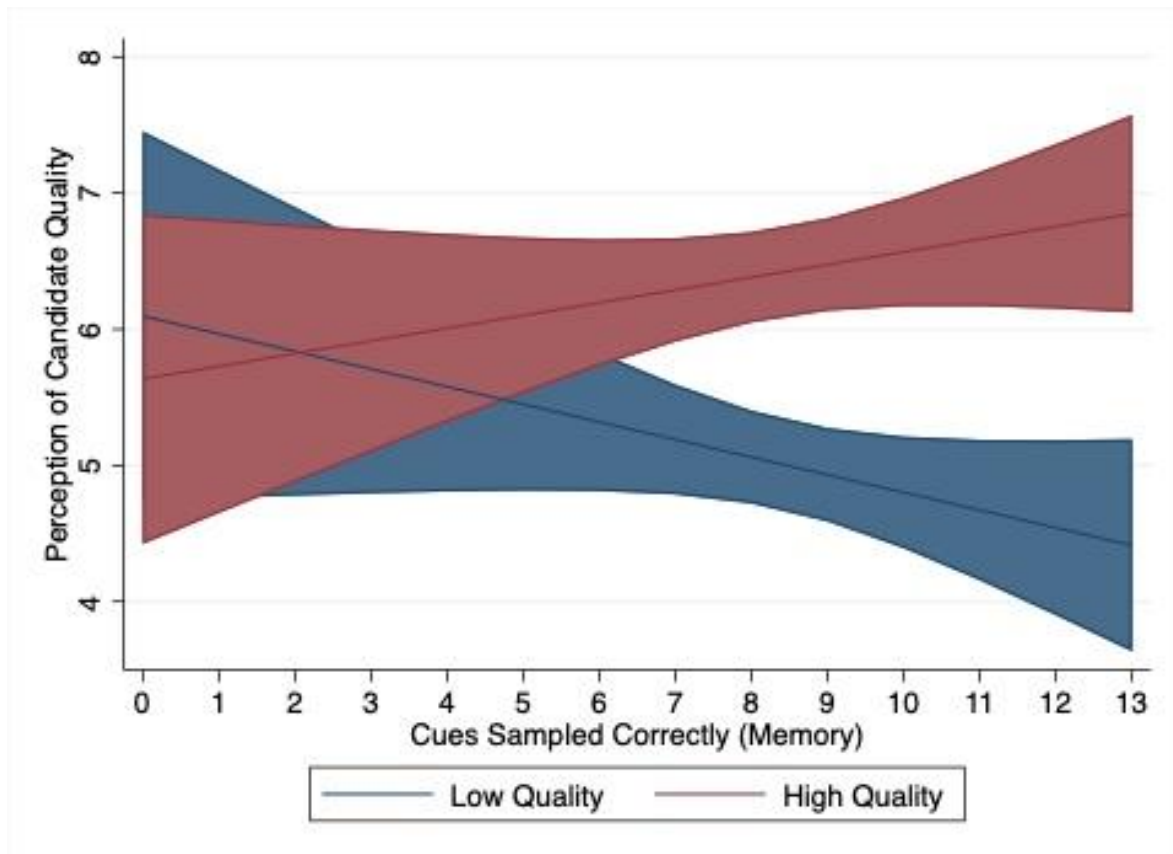This graph plots the relationship between cue sampling and perception of candidate quality.

Figure 10

This graph plots the longitudinal relationship between charisma and mindwandering over time.
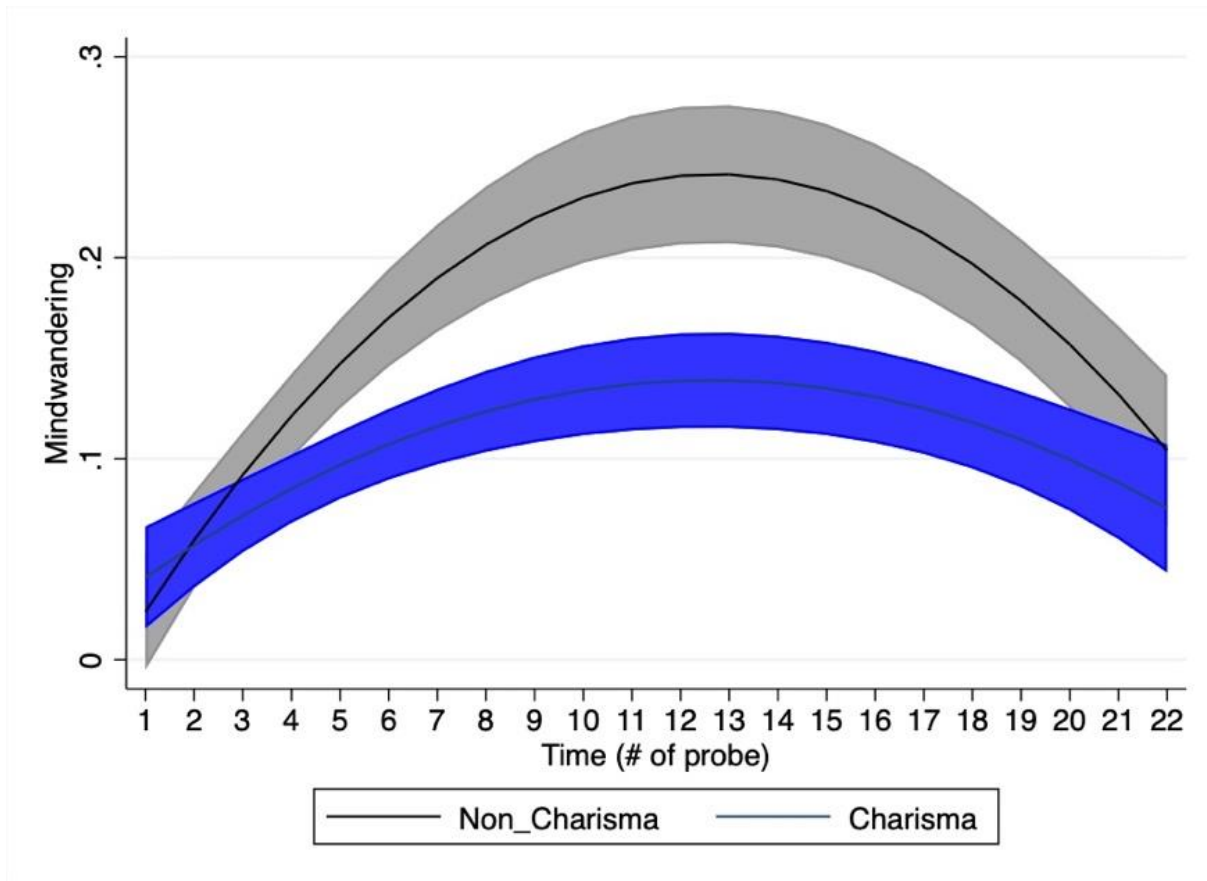
Figure 11a

Depiction of a decision involving the judgement (made by participant) of two separate locations for a new business venture: New York & Los Angeles. Note, it is assumed that the cue utilization and cue validity is equal for all cues.
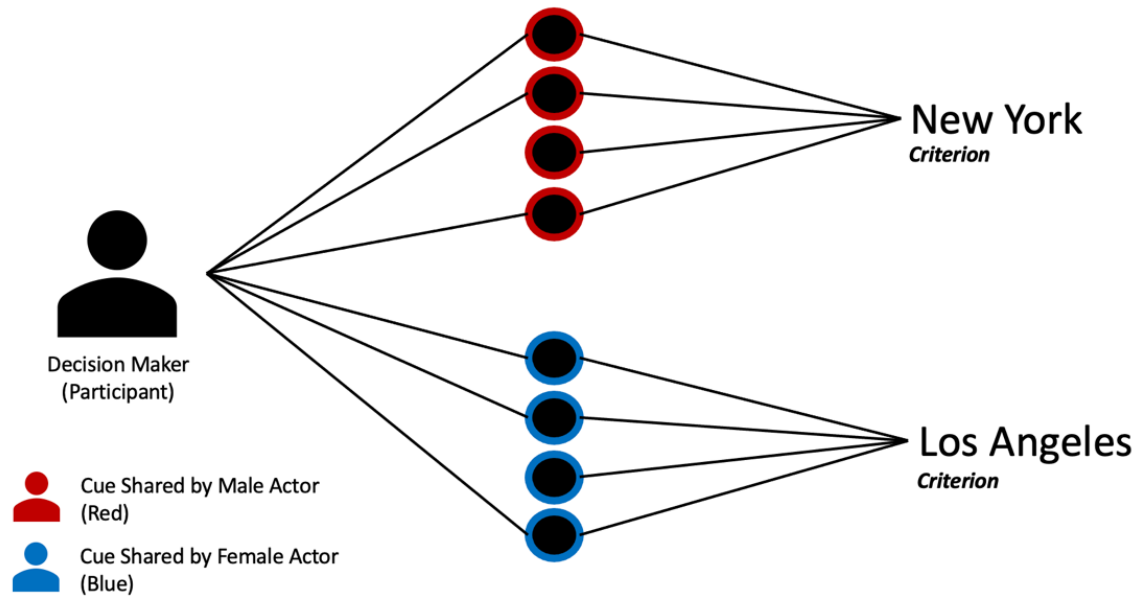
Figure 11b

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue). In this example, more cues are sampled for New York than Los Angeles, making this appear to be the optimal choice. Tests hypothesis 3a.
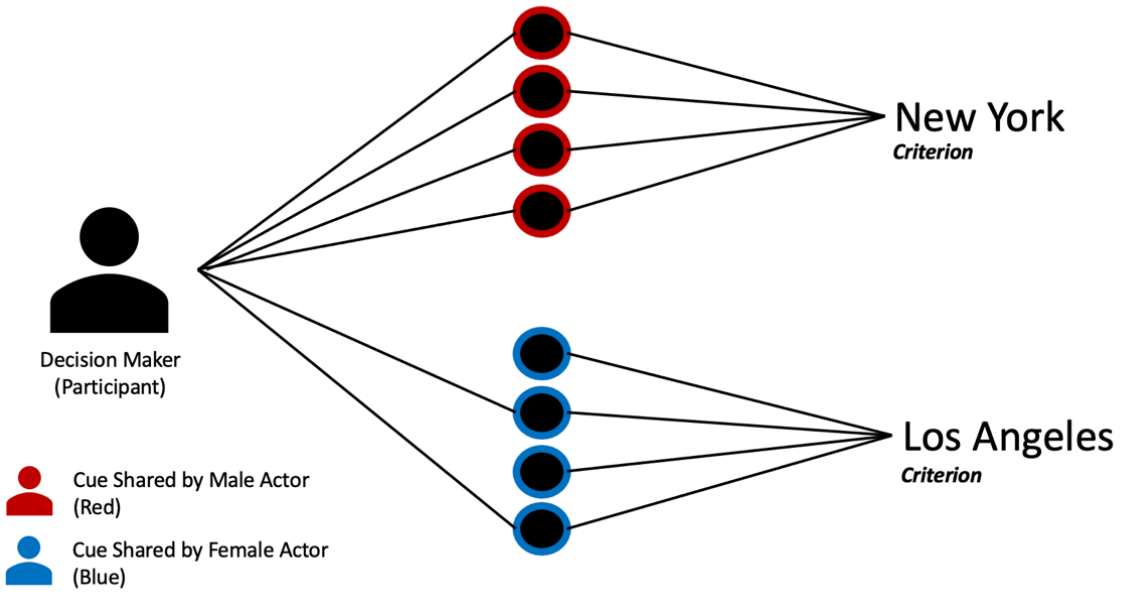
Figure 11c

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue) *and* including an extra cue for Los Angeles. In this example, despite there being more cues for Los Angeles, the decision samples more cues for New York and thus makes a sub optimal choice. Tests hypothesis 3b.
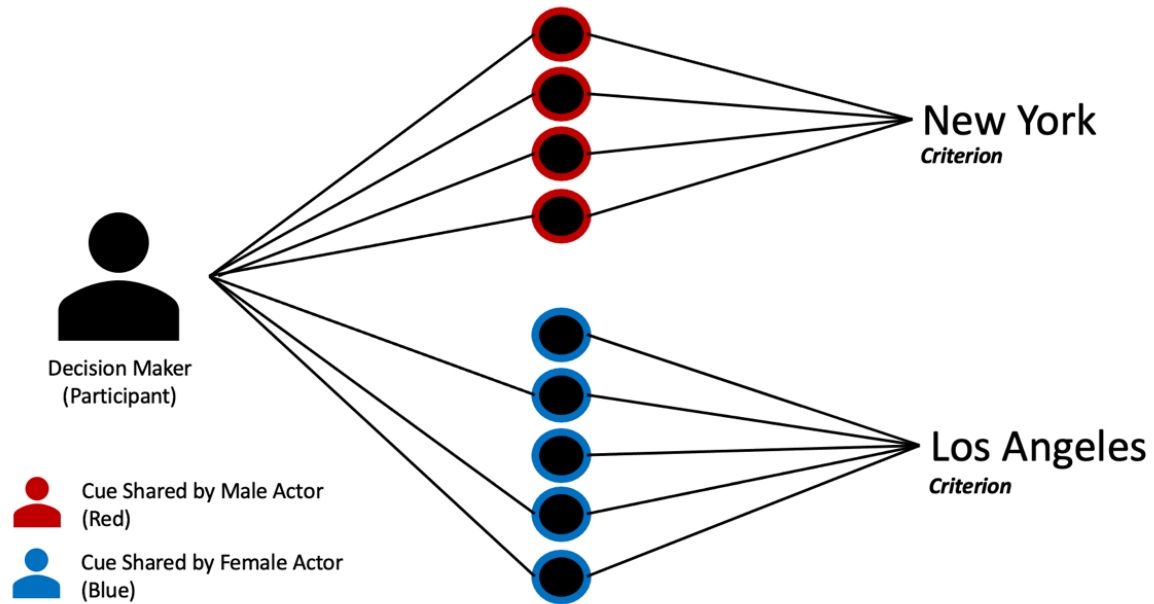
Figure 11d

Decision between "New York & Los Angeles" including and social attention bias in which the male actor (red) captures the attention of the audience more than the female actor (blue) *but* one of the cues for Los Angeles is the critical cue with the highest cue validity. In this example the decision maker misses the optimal cues and thus makes a sub-optimal choice. Tests hypothesis 3c.
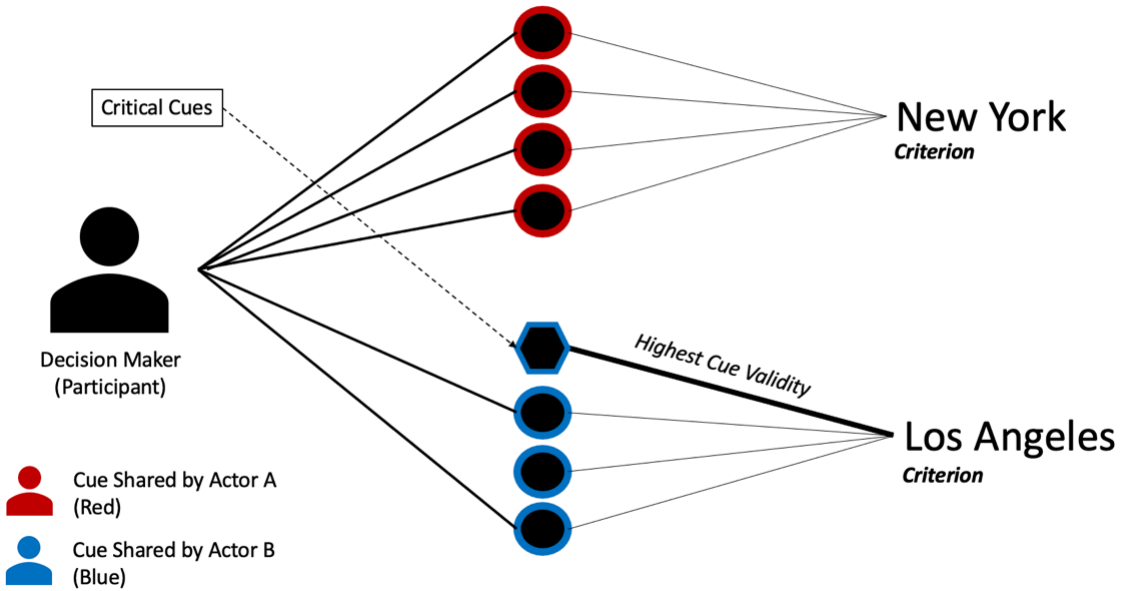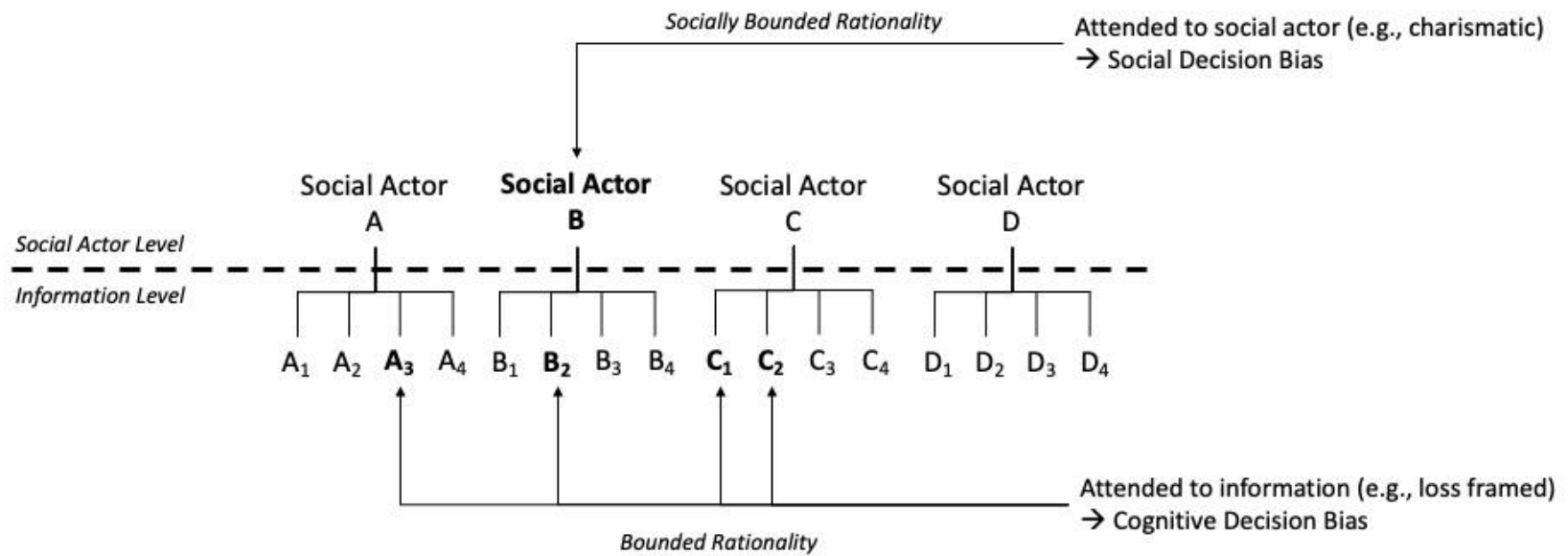
Figure 12

Model of socially bounded rationality describing how bias can emerge on two separate levels of analysis: the information level (below) and the social actor level (above).

APPENDIX

Social Attention Measures

Psychometric Scales

Generalized Inattentiveness

Reference: Kanfer, R., Ackerman, P. L., Murtha, T. C., Dugdale, B., & Nelson, L. (1994). Goal setting, conditions of practice, and task performance: A resource allocation perspective. *Journal of Applied Psychology*, *79*(6), 826.

Question Stem: The next set of questions relates to the extent you thought about things other than the interview. Remember, it is very natural for the mind to wander and for our study it is critically important that you answer these questions honestly.

To what extent do you agree or disagree with the following statements

Original	*Adapted*
I took "mental breaks" during the task	I took "mental breaks" during the interview
I daydreamed while doing the task	I daydreamed while listening to the interview
I lost interest in the task for short periods	I lost interest in the interview for short periods
I thought about other things that I have to do	I thought about other things that I have to do
I wondered about how my performance compared to others	I wondered about how my performance compared to others

Generalized Attention

Reference: Rothbard, N. P. (2001). Enriching or depleting? The dynamics of engagement in work and family roles. *Administrative science quarterly*, *46*(4), 655-684.

Question Stem: To what extent do you agree or disagree with the following statements

Original	Adapted
I spend a lot of time thinking about my work	I spent a lot of time paying attention to the interview
I focus a great deal of attention on my work	I focused a great deal of attention the interview
I concentrate a lot on my work	I concentrated a lot on the interview
I pay a lot of attention to my work	I paid a lot of attention to the interview

Selective Attention to Candidate/Interviewer

Reference: Rothbard, N. P. (2001). Enriching or depleting? The dynamics of engagement in work and family roles. *Administrative science quarterly*, *46*(4), 655-684.

Question Stem: The following questions relate to your selective attentiveness to the interviewer and job [interviewer/candidate] during the interview.

Please answer according to what really reflects your experience rather than what you think your experience should be.

Adapted
I spent a lot of time paying attention to the [interviewer/candidate]
I focused a great deal of attention the [interviewer/candidate]
I concentrated a lot on the [interviewer/candidate]
I paid a lot of attention to the [interviewer/candidate]

Mindwandering

Reference: Seli, P., Risko, E. F., & Smilek, D. (2016). Assessing the associations among trait and state levels of deliberate and spontaneous mind wandering. Consciousness and Cognition, 41, 50-56.

Question Stem: The next set of questions relates to the extent you thought about things other than the interview. Remember, it is very natural for the mind to wander and for our study it is critically important that you answer these questions honestly.

To what extent do you agree or disagree with the following statements

Intentional Mindwandering

Original	Adapted
I allow my thoughts to wander on purpose	I allowed my thoughts to wander on purpose
I enjoy mind wandering	I enjoyed mindwandering during the interview
I find mind wandering is a good way to cope with boredom	I found mind wandering to be a good way to cope with boredom during the interview
I allow myself to get absorbed in pleasant fantasy	I allowed myself to get absorbed in pleasant fantasy

Unintentional Mindwandering

Original	Adapted
I find my thoughts wandering spontaneously	I found my thoughts wandering spontaneously
When I mind-wander, my thoughts tend to be pulled from topic to topic	When I mind-wander during the interview, my thoughts tend to be pulled from topic to topic
It feels like I don't have control over when my mind wanders	It felt like I didn't have control over when my mind wandered during the interview
I mind-wander even when I'm supposed to be doing something else	I mind-wander even when I'm supposed to be listening to the interview

Thought Probes

Thought probes will measure selective attention throughout the VR Vignette.

Participants will be probed every 30 second period, the exact time of the probe will be randomly allocated to one second within each 30 second period. The spacing of the probes will be the same for all participants.

Thought probes will be coded into three different measures.

- Mind-wandering: Measured by the number of responses to "I was paying attention to something unrelated to the interview" (1) vs. other response options (0)

- Selective Attention (Candidate): Measures by number of responses to "I was paying attention to what the job candidate was saying and/or doing" (1) vs. other response options (0)

- Selective Attention (Interviewer): "I was paying attention to what the interviewer was saying and/or doing" (1) vs. other response options (0)

Participant Instructions

In this experiment we are also interested in what you might pay attention to. In order to examine this, the computer will periodically ask you what you were just thinking about.

In the following scenario you will be asked at random points where your *attention* is located, i.e., what you are paying attention to. During the experience you could be paying attention to a variety of different things in your external environment (e.g., the job candidate, the interviewer, the room) you can also be paying attention to something in your own head (e.g., thinking about future plans, daydreaming, thinking about what one of the people said earlier).

The thought probes aim to understand where your attention is at the exact moment that you were probed. When you see the probe, please respond based on what you were thinking just before the screen appeared. Do not try to reconstruct what you were thinking during the preceding words on the screen, and please select the category that best describes your thoughts as accurately as you can. Remember that it is quite normal to have any of these kinds of thoughts during an ongoing task.

The options are below:

1. **Listening/Watching:** Paying attention to what the candidate/interviewer was saying or doing in that moment

2. **Evaluating:** Thinking about the candidate's past responses or interviewer's questions

3. **Mindwandering:** Thinking about something unrelated to the interview, e.g., personal life or things in the room.

IMPORTANT: It is very important that you answer honestly and to the best of your ability. There will be no penalty based on your response and all your responses will be 100% anonymous.

Eye Tracking

Eye tracking will be measured using the Vive Pro Eye (see specification on the following page). All data available from the eye tracking software will be recorded and stored.

Primary analyses from eye tracking data will focus on a) time spent looking at candidate/interviewer, and b) number of unique fixation to the candidate/interviewer.

To determine these metrics a region of interest (ROI) will be assigned to the VR vignette. A two separate ROIs will be created: one for the candidate and one for the interviewer. The ROI for the candidate will specify exactly where the candidate is at each point in the interview and mark this position. The Vive Pro Eye will then automatically compute the amount of time individuals eye gaze will in this region and the number of times their eye moved towards this region.

In addition, measures of pupil size and eye openness will be recorded and potentially used in exploratory analyses.

Vive Pro-Eye Specification

Gaze data output frequency (binocular):	120Hz
Accuracy*:	0.5°–1.1°
Calibration:	5-point
Trackable field of view**:	110°
Data output (eye information):	Timestamp (device and system) Gaze origin Gaze direction Pupil position Pupil size Eye openness
Interface:	HTC SRanipal SDK

SDK engine compatibility:	Unity, Unreal

Memory Measures

Candidate Memory Questions (Study 1 & Study 2)

Below are a series of questions testing your memory of the interview that you just watched, try to get as many correct as you can.

Which emotion related skill did the participant say they had?

- Active Listening
- Empathy
- Emotion Recognition
- Emotion Appreciation
- Emotion Regulation

Which of these statements did the candidate say when talking about how they dealt with the challenging event:

- I raised my voice and told my colleague that they were being very hypocritical.
- I shouted at my colleague for being late in the past
- I regulated my emotion perfective and empathized with the other employee
- I waited a moment and took a big deep breath.
- I calmly told the other person to relax.

When asked about their social skills which of the following statements did the participants say? (Note, you can select multiple statements)

- I've always felt comfortable in social situations. My colleagues tell me that I am good at starting conversations with people I don't know.

- I always look to find common ground, things we both share.

- I've always had lots of friends inside and outside of work.

- I feel I'm able to make better relationships with people when I know them for a long time.

- I am good at introducing myself to people but can be a little bit forgetful about replying to emails or text messages straight away.

- I am always quick at responding to emails or texts.

- There was one event where I sat on a table of people and was able to make them all laugh.

- I find public speaking challenging.

- My friends tell me I am an extrovert.

Why were some employees in the job candidates last job willing to take a severance payment and leave the job willingly?

- The received a better job offer.
- They were hoping to move to a different industry.
- They wanted to go back into education.
- They wanted to travel.
- They didn't like the job.

Which coding language did the candidate learn to code in?

- C++
- R
- Java
- Python
- Java script

The job candidate mentions doing well in two particular classes at university, please select both from the options below:

- Human Resources
- Managerial Economics
- Operations Management
- Managing People at Work
- Organizational Behavior
- Introduction to Statistics
- Economics

When asked about their writing skills which of these statements did the job candidate say?

- At work people frequently asked me to write reports for them or proofread their work.
- At work someone once asked me to write a report for them and proofread their work.
- At work my friends asked me to write reports for them and proofread their work.
- At work the I am in charge of writing all the reports and proofreading other people's work.
- At work the once asked me to write a report and proofread my colleague's work.

The job candidate tutored student at university, how well did the student do?

- All student passed, all scoring in the top 20% of the class
- All student passed, one only barely passed
- All student passed, one scored top of the class
- Half the students passed, but one scored in the top 20%
- Half the students passed, one barely passed
- No students passed

The job candidate discussed their skills with excel, how did they describe their capabilities:

- I am good with excel and can use a lot of the more complex functions.
- I am not very good with excel but I can do some of the basic functions.
- I am not very good with excel but I am willing to learn.
- I am average with excel and better than some of my colleagues.
- I am terrible with excel and don't know how to use the basic functions.
- I am great with excel and my colleagues ask me to help them out sometimes

When asked if the job candidate was in a leadership position at their work they responded:

- I am not in a leadership position in my current job, but informally other colleagues would be asked to lead the team when the boss was away.
- I am not in a leadership position in my current job, but informally I would be asked to lead the team when the boss was away.
- I am in a leadership position in my current job, and would often lead meetings.
- I am partial leadership position in my current job, formally I am the boss when my boss is away.
- I am not in a leadership position in my current job but my boss said I have the potential to be.

The Job candidate mentioned a leadership training, what was its name:

- CMI management course on leadership
- BCG management course on leadership
- MLT leadership course for managers
- CLI course for future leaders
- DMI leadership training

How did the job candidate react when their colleague criticized someone for being late to a meeting?

- I waited a moment and took a big deep breath.
- I raised my voice and told my colleague that they were being very hypocritical.
- I shouted at my colleague and told them to show some respect.
- I helped diffuse the situation with my boss.
- I remember my leadership training and let my colleagues sort it out.
- I stayed silent because I knew it wasn't my job to get involved.

When discussing team working abilities the job candidate said:

- I also try to help out at my work with group projects.
- I also more generally help out at my work with group projects.
- I always help out at my work with group projects.
- I rarely help out at my work with group projects.
- I am in charge of helping out at my work with group projects.

Interviewer Memory Questions (Study 1 & Study 2)

When describing the role the job candidate will be working in if they are hired, the interviewer said:

- You will be working in a team of five.
- You will be working in a team of three.
- You will be leading a team of five.
- You will be leading a team of three.
- You will be working individually.

When will the interviewer inform the candidate about the job position:

- A couple months.
- Within six weeks
- A month
- A couple weeks.
- Six months.
- By the end of the week.
- He didn't mention it.

Which of these are questions the interviewers asked (Note, you can select multiple answers):

- Can you tell me about your writing skills?
- Can you tell me about the last time you had a difficult interaction with someone at work and how it was resolved?
- Can you tell me about a time you helped out a colleague at work?
- How did you participate in your past organization to make it better?
- Can you tell me about your presentation skills?
- Can you tell me about your networking skills?
- Can you tell me about your personal life?
- Can you tell me about a time you showed initiative and went the extra mile at work?
- Can you tell me about your greatest achievement in your last job?
- Describe your leadership abilities?
- How in the past have you been able to motivate your colleagues?

Study Design: Towers Market (Chapter 3)

Introduction

SCREEN 1:

[ID] Participant Number:

SCREEN 2:

[VIDEO]

Advertising

SCREEN 1:

[TEXT box] The next decision they discuss will be about: **ADVERTISING**

When you are ready to start click [continue].

SCREEN 2:

[VIDEO – scene number?]

SCREEN 3:

[Text box] Thank you for observing the discussion around the ADVERTISING issue.

Next, you will be asked to make your recommendation related to your decision and perceptions of the issue.

SCREEN 4:

[AD_Q1] Please make your decision below between the two options for advertising:

- o The vendors in the market should advertise COLLECTIVELY
- o The vendors in the market should advertise INDIVIDUALLY

(Display: Multiple choice, single answer)

SCREEN 5:

[AD_Q2a].

Following is a list of statements, some of which were said in the meeting and some were not (this question is split over two pages)

Please select ALL the statements that were said in the meeting.

(More statements on following page)

- o A collective campaign would be cheaper for some vendors. (1)
- o Some vendors think their customers are too old and don't respond to marketing. (0)
- o Some vendors already have contracts with advertising agencies so they would lose this money if they worked collectively. (0)

o A collective campaign would mean that vendors with an established brand would have to change their own campaigns which would be challenging. (1)
o A collective campaign could allow vendors to advertise across a lot of different channels (e.g., social media, word of mouth, billboards, etc). (0)
o Vendors didn't want their visions limited by others, so would prefer advertising individually. (1)

[AD_Q2b].

Please select ALL the statements that were said in the meeting.

o Vendors like the idea of working collectively because it means more flyers could be handed out. (0)
o Some vendors work mainly on word of mouth so would prefer advertising individually. (1)
o The city is offering discounts for companies who adversity individually to increase sales. (0)
o A collective campaign would help establish the image of the market and generate more interest from customers. (1)
o In the past some vendors have done minimal advertising so would benefit from working collectively. (1)
o Some vendors have paid a lot of money to make a new slogan for their company, so would prefer working individually. (0)

(Display: Multiple choice, multiple answers)

SCREEN 6:

[AD_Q3] Below is a list of some points shared in the meeting, please rank them in order of importance when making your decision.

(i.e., put the most important point first and least important point last):

o A collective campaign would set a market image and create interest for all of the vendors
o A collective campaign would limit vendor's visions, so vendors should market individually
o Some vendors work on word of mouth, so would prefer individual campaigns
o Some vendors do minimal advertising, so would prefer individual campaigns
o Some vendors have established brands already that they would need to change, so would prefer individual campaigns.
o A collective campaign would be cheaper for some vendors.

(Display: Rank question)

Maintenance

SCREEN 1:

[TEXT box] The next decision the team will discuss is about: **MAINTENANCE**

When you are ready to start click [continue].

SCREEN 2:

[VIDEO – scene #?]

SCREEN 3:

[Text box] Thank you for observing the discussion around the MAINTENANCE issue.

Next, you will be asked to make your recommendation related to your decision and perceptions of the issue.

SCREEN 4:

[MT_Q1] Please make your decision below between the two options for Maintenance:

- o The vendors should be responsible for their OWN maintenance costs (1)
- o The vendors should SHARE maintenance costs (0)

(Display: Multiple choice, single answer)

SCREEN 5:

[MT_Q2a] Following is a list of statements, some of which were said in the meeting and some were not (this question is split over two pages)

Please select ALL the statements that were said in the meeting.

(More statements on following page)

- o By sharing costs vendors could make a deal with supplier and potentially get a discount (1)
- o Some of the vendors think that by working collectively the maintenance staff could be more efficient. (0)
- o Smaller vendors felt they would be better off just focusing on their own area. (1)
- o Some vendors already have cleaning staff they work with and wouldn't want to fire. (0)

- One vendor said they would drop out of the project if the maintenance costs were shared collectively. (1)
- Sharing maintenance costs would help keep costs down (1)

[MT_Q2a]

Please select ALL the statements that were said in the meeting.

- Vendors felt that dividing the costs of maintenance equally was fair since customers are often shopping in more than one of our stores per visit to the market. (1)
- One of the vendors is a maintenance firm and if done collectively could give a good discount. (0)
- Just because some stores are larger doesn't mean their customers are messier and should pay more, so sharing the cost is fair. (1)
- One of the vendors has past experience doing maintenance together with other vendors and found it very challenging. (0)
- Doing maintenance individually would allow vendors to hire specialized staff. (0)
- Some of the vendors thought that doing maintenance individually would mean the marketplace became very messy. (0)

(Display: Multiple choice, multiple answers)

SCREEN 6:

[MT_Q3] Below is a list of some points shared in the meeting, please rank them in order of importance when making your decision.

(i.e., put the most important point first and least important point last):

- Sharing costs is fair because customers visit multiple stores
- Sharing costs is fair because larger stores don't make more mess
- Sharing costs could help suppliers get a discount
- Small vendors felt they'd be better off focusing on their own area
- A vendor would drop out if maintenance costs were shared
- Sharing maintenance costs would help keep costs down

CLERKS

SCREEN 1:

When you are ready to start click [continue].

SCREEN 2:

[VIDEO] – scene #?

SCREEN 3:

[Text box] Thank you for observing the discussion around the CLERKS issue.

Next, you will be asked to make your recommendation related to your decision and perceptions of the issue.

SCREEN 4:

[CK_Q1] Please make your decision below between the two options for advertising:

- o The vendors should hire clerks as a GROUP (0)
- o The vendors should hire clerks INDIVIDUALLY (1)

(Display: Multiple choice, single answer)

SCREEN 5:

[CK_Q2a] Following is a list of statements, some of which were said in the meeting and some were not.

Please select ALL the statements that were said in the meeting.

- o If the clerks were hired by the market as a whole, vendors feel that they will be confused about their exact duties and will be inefficient in servicing any customers. (1)
- o Vendors believed sharing costs would make hiring personnel cheaper and more efficient (1).
- o Hiring staff individually for each store would be cheaper. (0)
- o Having clerks work in different stores could help the job feel less monotonous and thus keep them engaged. (0)
- o Having clerks responsible to a single vendor might make them more committed. (1)
- o One of the vendors has agreed to provide customer service training which could improve the quality of service for collective staff. (0)

[CK_Q2b]

Please select ALL the statements that were said in the meeting.

- o Vendors require different number of staff at different times of year, hiring individually would give them more flexibility to do this. (1)
- o Some vendors are family run businesses and wouldn't want non-family members working in their store. (0)
- o Hiring collectively will help train clerks in numerous skills which might attract good candidates. (0)
- o Hiring staff collectively would allow vendors to move staff around according to shifting demands in different departments. (1)
- o Some vendor's business is built on the expertise of their personnel, training everyone in those skills would be expensive (1)
- o The clerks for some vendors do not require any special expertise, beyond being trained to offer exceptional service. (1)

(Display: Multiple choice, multiple answers)

SCREEN 6:

[CK_Q3] Below is a list of some points shared in the meeting, please rank them in order of importance when making your decision.

(i.e., put the most important point first and least important point last):

Hiring staff…

- o Hiring clerks collectively would allow vendors to move staff according to demand
- o Hiring clerks individually would give vendors flexibility to vary staff numbers
- o Hiring clerks collectively would make hiring cheaper and more efficient
- o Hiring clerks collectively would make vendors confused about their duties, so individual hiring is preferred
- o Hiring clerks collectively makes it costly to train staff in each store's specialty, so individual hiring is preferred
- o Hiring clerks collectively works, all staff need is training in great service
- o Hiring clerks individually might make staff more committed to their store

(Display: Rank question)

Location

SCREEN 1:

[Text Box] The next decision they discuss will be about: **LOCATION**

When you are ready to start click [continue].

SCREEN 2:

[VIDEO] – scene#

SCREEN 3:

[Text box] Thank you for observing the discussion around the LOCATION issue.

Next, you will be asked to make your recommendation related to your decision and perceptions of the issue.

SCREEN 4:

[Loc_Q1] Please make your decision below between the three options for location:

- o Riverside
- o Industrial Site
- o City Center

(Display: Multiple choice, rank question)

SCREEN 5:

[Loc_Q2] Please indicate which of the following meeting members first suggested the CITY CENTER as an option for the sight.

- o Picture of Ken
- o Picture of Louis
- o Picture of Sam
- o Picture of Jordan

(Display: Multiple choice, single answer)

[Loc_Q3] Please indicate which of the following meeting members first suggested the RIVERSIDE as an option for the sight.

- o   Picture of Ken
- o   Picture of Louis
- o   Picture of Sam
- o   Picture of Jordan

(Display: Multiple choice, single answer)

[Loc_Q4] Please indicate which of the following meeting members first suggested the INDUSTRIAL SITE as an option for the sight.

- o   Picture of Ken
- o   Picture of Louis
- o   Picture of Sam
- o   Picture of Jordan

(Display: Multiple choice, single answer)

Ending

Screen 1:

[Text box] Thank you for participating in this meeting you can take off the headset.