Jess Darby

Veridical episodic simulation: Cognitive mechanisms of truly experienced or intended events in the personal past and future

Thesis submitted in fulfilment of the degree of Doctor of Philosophy

Department of Psychology, Royal Holloway, University of London

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Declaration of Authorship

I, Jess Darby, hereby declare that this work was carried out in accordance with the Regulations of the University of London. I declare that this submission is my own work, and to the best of my knowledge does not represent the work of others, published or unpublished, except where duly acknowledged in the text. No part of this thesis has been submitted for a higher degree at another university or institution.

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Abstract

A considerable body of recent research has examined the capacity to experience the personal future, known as episodic future thinking or prospection (MacLeod, 2017). One function of prospection is to align plans with current goals (Szpunar, Shrikanth & Schacter, 2018). Although planned behaviour is only weakly related to enacted behaviour (Sheeran & Orbell, 2000), attempts have been made to examine episodic future thinking as a hallmark of veracity when individuals lie or tell the truth about their intentions (Granhag & Mac Giolla, 2014). This PhD investigates whether true experience and veridical intention influence i) subjective phenomenology; ii) plausibility, likelihood and detail; and iii) memorial performance.

Study 1 (n = 60) examined subjective features of events that are believed compared to plausible but not-believed events in the near future. Participants also simulated believed and not-believed events from the recent past. In both temporal directions, belief was related to longer statements, heightened autonoesis, sensory, spatial and affective ratings and field perspective. Judges did not agree on what constituted a plausible statement but believed past events were more detailed and seen as more likely to have occurred.

Words encoded in the context of the future are better remembered than atemporal or past scenarios (Klein, Robertson and Delton, 2010). Across three experiments, Study 2 (n = 114, 77, 156) showed that the intention to participate in a future event did not enhance memorial performance.

Events related to personal goals engender more vivid prospection than experimenter-cued or atemporal events (Lehner & D'Argembeau, 2016). Study 4 (n = 34) compared salient and not-salient goals set two weeks and one year in the future. Salience but not temporal distance led to higher ratings for personal plausibility, autonoesis, sensory and spatial details.

Study 4 (n = 90) extended findings from Studies 1 with teenagers, who made drawings of believed and not-believed events set two weeks around the present. Belief was associated with subjective vividness but judges did not agree on detail, plausibility or visual perspective.

Previous research has employed drawings to discriminate liars from truth tellers (Mac Giolla, Granhag & Vernham, 2017). Study 5 (n = 74) employed a mock-crime paradigm about an imminent future activity (Granhag & Knieps, 2011). Judges rated truth tellers' drawings as more detailed but not more plausible.

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The studies in this thesis draw on distinct areas of research that are not often interrelated. The evidence presented in this thesis is my own work and has been developed under tutelage for which I am very grateful. For professional guidance and development on the aspects of the thesis that relate to mental time travel, I would like to thank Professor Andy MacLeod. For professional guidance and development on psycho-legal aspects of this thesis, I would also like to thank Professor Amina Memon, Dr Alan Scoboria and Dr Ruth Horry. In addition, this thesis would not have been possible without the wisdom, endorsement and advocacy of Professor Johannes Zanker, Professor Rosemary Deem, Professor Kathy Rastle and Dr Ryan McKay. Thank you all very much.

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Contents

CHAPTER 3: EXPERIMENTAL

TRAVELLING IN TIME STUDY 1(a), 1(b), 1(c), 1(d)

CHAPTER 4: EXPERIMENTAL

THE FUTURE AS A MNEMONIC STUDY 2(a), (b), (c), (d), (e)

CHAPTER 5: EXPERIMENTAL

FAST FORWARD STUDY 3(a) (b)

List of Tables

List of Figures

Chapter 1

Introduction and Literature Review

1.1 Defining Episodic Future Thinking

Prospection is the mental simulation of future possibilities (Bucker & Carroll, 2007; Gilbert & Wilson, 2007). Episodic future thinking is the ability to mentally simulate specific personal episodes that are anticipated to take place in the future (Szpunar, 2010). This cognitive capacity occurs so fluidly and frequently that we rarely question how we come to have a veridical sense of what lies ahead, when the future is by definition both unlived and unknown (Tulving & Szpunar, 2012). The neural and cognitive mechanisms engaged when sampling future events have been the focus of new avenues of research in cognitive psychology, neuroscience, developmental and clinical psychology (Schacter, Benoit & Szpunar, 2017). Although still emerging, the evidence suggests that remembering the past and pre-experiencing the future share a core neural network (Benoit & Schacter, 2015; Schacter, Addis, Hassabis, Martin, Spreng & Szpunar, 2012). Parallels in these systems are striking, from the age in which mental time travel first emerges in young children to mirror neuropsychological deficits in patients who struggle to access a continuous sense of self across time (Klein, 2012; Suddendorf & Moore, 2011; Szpunar & Chan, 2018). From functional and clinical perspectives, recent research has explored commonalities between thinking about the past and projecting the self into the future because the faculty of prospection is a requisite of psychological functioning (MacLeod, 2017; Seligman, Railton, Beaumeister & Stripada, 2013).

Some argue that the ability to re-experience events from our past is a late adaptation marking a unique difference between human and non-human animals (Tulving, 1985). Although most individuals assume their recollections to be accurate and reliable, psychologists have long known

that memory is subjective and prone to bias (Bartlett, 1932). The experience of reconstructing and re-experiencing an event from memory was characterised by William James as remembrance: *A direct feeling; its object is suffused with a warmth and intimacy to which no object of mere conception ever attains* (1890, p. 239). This sense of subjective re-experiencing that accompanies episodic memory is implicitly used as a veracity marker, a process called reality monitoring (Johnson & Raye, 1981). A memory accompanied by sensory detail and a feeling of re-living prompts an individual to believe that what they remember is accurate and true (Foley, 2018).

This distinction in the extent to which recall is accompanied by a sense of immersion and affect has been framed as noesis or 'knowing' (Tulving, 1985). Procedural memory – knowledge that can be accessed without awareness, such as riding a bicycle – is anoetic (non-knowing). Semantic memory is knowledge that can be retrieved without subjective re-experiencing. This type of recall is associated with noetic consciousness or knowing without experiencing. By contrast, episodic memory is characterised by autonoetic consciousness: the ability to retain a subjective sense of self and identity across time, from the personal past to the personal future. Using a combination of episodic memory and autonoetic consciousness, humans are at liberty to re-experience the past and this has been assumed to underlie the capacity to generate representations of the personal future (Suddendorf and Corballis, 1997, Wheeler, Stuss & Tulving, 1997). In recent years memory scientists have extended research on the processes of memory to examine the means by which it is possible to report on the subjective experience of an event that is set in the future: a process known as episodic future thinking (cf. Atance & O'Neill, 2001; Schacter, Addis & Buckner, 2008; Szpunar, 2010).

Episodic future thinking differs from semantic knowledge of the future because it involves simulation of an anticipated experience. The constructive episodic simulation hypothesis suggests that when generating future imagined scenarios, situation-relevant goals will determine flexible retrieval from past personal experience to furnish these accounts (*e.g.* Addis et al., 2007; Madore, Gaesser & Schacter, 2014; Schacter & Addis, 2007; Schacter, Addis & Buckner, 2007). Schacter and colleagues refer here to a memory system with the capacity to flexibly recombine elements of past experience to construct a likely representation of an event in the future (Schacter, Carpenter, Devitt, Roberts & Addis, 2018). When simulating a future event, projections will be shaped by semantic knowledge about likely constraints such as time and practicalities and also by prior experience (Szpunar, 2010; Gilbert & Wilson, 2007). Thus future episodic thinking is more than daydreaming or imagining (McMillan, Kaufman & Singer, 2013; Singer, 1966; 1975). The benefit of the ability to orient behaviour by drawing on past experience to simulate potential future scenarios is clear. In a survival scenario, knowing from memory that a bear is dangerous would not be enough to keep you alive if you did not also have the ability to evaluate hypothetical solutions and make choices that allow you to evade or escape the encounter (Gilbert & Wilson, 2007). The capacity to mentally travel in time allows flexible recombination of past, present and future information to generate action plans (Ingvar, 1979). Sometimes this can lead to errors in judgement, which arguably might enhance the benefit of lived experience as a resource available in the future because we can learn from our mistakes (Wilson, Meyers & Gilbert, 2001). Less obviously, this capacity to flexibly recombine traces is subject to processing errors that may reduce the accuracy of memory and future thinking and can even lead to bilateral distortion (Devitt & Addis, 2016).

In a speech made in Washington on March 17 2008, Hillary Clinton said of a trip to Bosnia 12 years earlier:

> *We came in in an evasive manoeuvre… I remember landing under sniper fire… there was no greeting ceremony… we ran with our heads down, we basically were told to run to our cars… there was supposed to be some kind of a greeting ceremony at the airport, we basically were told to run to our cars, that is what happened.*

While Clinton clearly had a specific scenario in mind when describing this scene from 25 March 1996, the accuracy of her recollection was contradicted by journalists. The story is summarised in feedback on The Washington Post website (http://voices.washingtonpost.com/fact-checker/2008/03/hillarys_balkan_adventures_par.html). Video footage of the event shows that on disembarking from the flight, Hillary and Chelsea Clinton were welcomed by a young girl in an official ceremony on the tarmac (http://www.youtube.com/watch?v=iOsGo_HWP-c). There were no snipers and there was no sign of any kind of security threat.

Clues to how this mistaken recollection came about can be found in a witness report from Lissa Muscatine, a Clinton aide who was a passenger on the same military flight. On the approach to landing, Clinton was briefed to expect a potentially threatening scene on arrival. Muscatine recalled:

> *We were put on a C17 – a plane capable of steep ascents and descents – precisely because we were flying into what was considered a combat zone. We were issued flak jackets for the final leg because of possible sniper fire near Tuzla. As an additional precaution, the First Lady and Chelsea were moved to the armoured cockpit for the descent into Tuzla. We were told that a welcoming ceremony on the tarmac might be cancelled because of sniper fire in the hills surrounding the airstrip. From Tuzla, Hillary flew to two outposts in Bosnia with gunships escorting her helicopter.*

While it is possible that Clinton was lying it seems more likely that this was a mistake. Until corrected by video evidence, Clinton chose to publicly defend her recollection, which suggests that she privately believed that what she had remembered was accurate. This type of mistake is an example of a memory source confusion (Johnson, Hashtroudi & Lindsay, 1993). On the basis of the information presented by these witness accounts, the source of the confusion was an imagined but never-experienced, future event (Loftus, British Psychological Association Conference, Glasgow, May 2011). Furthermore, when considering how this error could happen, it is worth noting that the event described is analogous to a survival scenario, a highly effective mechanism for encoding information (Nairne & Pandeirada, 2016; Nairne, Thompson and Pandeirada, 2007). In Chapter 4 the evidence for survival processing and future thinking as encoding mechanisms is reviewed and the extent to which memory can be primed by intention is examined in a series of experiments.

This example highlights several aspects of this PhD project, which investigates the subjective experience of prospection for anticipated and non-anticipated events in the future. It is well established that the reconstructive nature of memory can result in memory errors (Devitt & Schacter, 2016; Schacter, 1999; 2001). In this thesis, research is presented that shows that the subjective experience of prospection varies by the extent to which the future event is believed to be something that is really going to happen. The Clinton example demonstrates that the high salience of a future scenario can lead to preferential encoding. In this example, an anticipated but never-experienced scenario was more available than the true events of that day when recalled 12 years later. The extent to which memory is veridical has received recent research attention (Mahr & Csibra, 2018; Schacter et al., 2018). The research presented in this thesis provides evidence that people are able to generate future events whose characteristics significantly differ on the basis of

whether or not they are believed to tap into a veridical sense of the personal future at a distance of two weeks Studies 1(b), 4(b) and one year in study 3(b). Results contribute to the evidence that having a belief in the occurrence of a future event, despite the meta-awareness that the event may never actually happen, is an orienting aspect of prospection (Ernst & D'Argembeau, 2017).

Judgements about whether an autobiographical event is real or true have been examined (for recent reviews, see Conway, Justice & Morrison, 2014; Foley, 2015) and there is a literature on how plausibility evaluations guide us to trust the content of our memories (Mazzoni, 2007; Mazzoni & Memon, 2003; Sharman & Scoboria, 2009; Scoboria, Mazzoni, Kirsch & Relyea, 2004). Less is known about how a future event could be rated plausible or true, since by definition, the event has yet to occur and may indeed never occur. This sense of likelihood that something will happen in the future has been examined by contrasting the nature and determinants of belief in past and future events (Ernst & D'Argembeau, 2017). After generating autobiographical events, participants rated phenomenological qualities and reported metacognitive judgements on the accuracy, autonoesis and likelihood of occurrence for each event. Qualitative and quantitative analyses indicated that the processes underlying belief varied by temporal direction. Specifically, future events felt more real when autobiographical context was strong, the event was more personally plausible and the event was personally important. Knowing when in the future the event was located made it seem more real. Distance from the present moment was not constrained by Ernst & D'Argembeau, thus all remembered events may have been easily accessible and highly believed (Scoboria & Talarico, 2013). The authors called for further research to expand the variability of belief in occurrence in both past and future events to extend and refine these results.

1.2 Terminology in the Thesis

The research in this thesis follows two strands. Evidence that the subjective experience of mental time travel varies by the extent to which the event is believed to be a veridical representation of the future is the first. The second strand refers to a literature that is not often drawn upon within the broader field of memory science. The relationship between intention and behaviour and the extent to which goals lead to action has long received research attention in health and forensic psychological literature (for a recent review, see Sheeran & Webb, 2018). Prospective memory research investigates the means by which people can be helped to adhere to their future plans (Gollwitzer, 1999; Gollwitzer & Crosby, 2018). The second strand of evidence explored in this thesis is drawn from psycho-legal literature. Future thinking and intention are current topics because sometimes individuals make false claims about specific personal episodes that will occur in the future. For example, if a suspect is arrested and interviewed before an alleged and/or intended crime has taken place. Early indications have suggested that deceptive statements made about future events are more readily detected than deceptive statements about the past (Vrij, Leal, Mann & Granhag, 2011; Vrij, Granhag, Mann & Leal, 2011). This thesis makes a contribution to existing knowledge on behaviour in the presence and absence of intention that is relevant to the study of episodic future thinking and also to psycho-legal research. In study 5, a deception paradigm is employed to show that intended events are represented in more detail in words and drawings but that this was not accompanied by variation in the phenomenology associated with episodic future thinking. The primary aim of this PhD is to identify phenomenological characteristics and markers associated with truly intended future events. A secondary aim is to examine the processes by which veracity or credibility judgements are made when intended and not-intended future events are described in words or depicted in drawings.

In describing the studies in this thesis, it was difficult to find an all-purpose terminology that captured veridical belief in the occurrence of events whether these were set in the past or future, close or distant in time. Since only the passage of time can verify the future as objectively 'true', considerations of belief in occurrence of prospective events are necessarily more nuanced, especially when these vary in temporal distance from the present. For example, it may be easier to rate belief in the occurrence of a hypothetical event due to take place later today compared to an event set two months in the future. Therefore in the studies of the thesis, different terms such as *salient*, *believed*, *intended* and *fictitious* are employed and these will now be explained in more detail showing how belief in the occurrence of events is the principal that unites this terminology.

The term *salient* is employed in Studies 2 and 3 of this thesis to indicate future events that are believed to be going to occur, and are therefore hypothesised to be more available and accessible. For example in study 3(b) all events were set in the near (two weeks) or distant (one year) future. Salient near future events were self-selected as believed on the basis that these were already in each participant's diary or calendar. Salient distant future events were nominated on the basis of being important goals that participants believed they were already moving towards carrying out in the future. In this way the status of salient events as being believed to be going to occur was comparable in all respects bar temporal distance. Subsequent self-ratings of belief in occurrence confirmed salience as an index of belief. Salient future events received significantly higher belief ratings compared to non-salient events, whether these were close or distant in time. In study 2, the salience of events that were believed to be going to occur at a distance of two months was examined as a potential mnemonic. Here it was of interest to see if participants who believed they would carry out an activity would show a salience-related preference to recall related words. In terminology used in

Chapters 4 and 5, events described as *salient* are events that are believed to be going to occur.

In psycho-legal literature, discrimination of events that are really believed to be going to occur is an important consideration. This has application in real world investigations where deliberate deception is sometimes used to deflect questioning about future plans. A fictitious intention might be employed to mask a person's true (illicit) intention. In the course of the thesis, future events described as *intended* are believed by that person to be going to occur. *Not-intended* events are not believed to be going to occur. In studies 1 and 4, the term *fictitious* is sometimes used as a synonym for events that are not believed to have occurred in the past or are not believed to be going to occur in the future. Although there is no belief in occurrence or intention to carry out these activities, nor were these conceived as or constructed to be deliberate lies. Nevertheless, where discussion of belief in future events is relevant to psycho-legal considerations, the terms *intended* or *not intended* are sometimes used in this thesis to highlight examples of mental time travel for not-believed (but not-lied-about) events.

Deliberate lies are examined in Chapter 7, which investigated the desire to conceal true intention with a cover story that sounds believable or true to other people. *Truth tellers* were given a mission and then interviewed about how they would carry out this mission in the immediate future. *Liars* were given a different mission (to plant a memory stick in a specific location). During interviews, liars followed experimental instructions to conceal the mission they believed they would carry out by presenting a cover story to the interviewer. Results of this study confirmed a group difference between liars and truth tellers in self-rated belief in the occurrence of the future event that had been described. Thus in study 5, although the intention to carry out the activity was based on experimental

instructions rather than participants' pre-existing personal plans, groups still varied on the basis of belief in occurrence.

To summarise: in this thesis, the term *veridical* is an overarching term for intended or experienced personal events that are believed to have occurred (past) or to be going to occur (future). The extent to which personal intentions, plans or goals form constituent parts of veridical representations of the future is examined. This thesis explores cognitive mechanisms of prospection and memory for veridical events to see how these differ from personally plausible events that are either set in the past (studies 1 & 4) or are not current intentions, plans or goals (studies 1–5). In studies 1-4, belief in occurrence as a veridical construct is the focus of the studies. In study 5, events varied on the basis of belief in occurrence but this belief was not veridical in the sense that no participant entered the laboratory with a pre-existing intention to carry out the activities that took place in either condition. Thus the presence or absence of veridical belief in the occurrence of events is the uniting theme across all studies in the thesis but a range of terms (*salient*, *believed*, *intended*, *fictitious*) are used to capture specific aspects of veridical belief.

1.3 Functions Supported by Episodic Future Thinking

Taxonomies of prospection have attempted to capture the functions of episodic future thinking and consider the capacities made by the noetic component of episodic future thinking compared to anoetic mental time travel (Szpunar, Spreng & Schacter, 2014). The capacity to travel forward in time by sampling hypothetical future scenarios allows a range of functions, some of which involve episodic future thinking and some engage scaffolding comprised of semantic knowledge about what is likely in the future (Irish & Piguet, 2013). A range of theories address the mechanisms of mental time travel and the extent to which it may or may not depend on episodic and semantic memory (for a recent summary of conceptual arguments see Michaelian, Klein & Szpunar, 2016). The

organisational framework in which episodic future thinking processes are believed to operate has been illustrated by work focusing on how simulation, prediction, intention and planning are carried out (Szpunar et al. 2014). Studies 4 and 5 may capture aspects of spatial navigation in mental time travel. The particular focus of research in this thesis is prospection for believed events, thus the question of how goals shape thoughts about the future is the primary focus of the literature reviewed here.

1.3i Goal Setting. Goals vary in the level of abstraction with which they are represented (Austin & Vancouver, 1996). D'Argembeau (2016) has suggested that concrete goals such as arriving to an appointment on time are organised in a hierarchy below abstract goals, such as being a better person. In this model, episodic future thinking is a process by which plans are fine tuned in relation to higher order, more abstract goals. The goal-relatedness of the representation of a future event has been shown to differentiate cortical activation (D'Argembeau, Stawarczyk et al., 2010) and ease of generation (D'Argembeau & Mathy, 2011). Goal-related future thoughts can be consciously and effortfully thought about or can occur during mind wandering (Stawarczyk & D'Argembeau, 2015). The capacity to pre-experience possible scenarios allows the feasibility of goals and plans to be calculated, evaluated and adjusted, minimising risk and conferring adaptive advantages. Study 3 of this thesis shows that prospection for future events related to personal goals feels subjectively different to plausible but goal-unrelated future events.

The goal-relatedness of prospection has bi-directional benefits. Successful goal-striving not only brings goal attainment closer but also shapes and maintains a subjective sense of self across time, enabling a coherent narrative that extends from what was important in the past to what will be important in the future (Conway, 2005; D'Argembeau, 2016; Demblon & D'Argembeau, 2017; Rathbone, Conway & Moulin, 2011). In particular, we

experience a heightened salience for the just-experienced and imminently-anticipated: mental time travel in both directions is more available and vivid in a three-day window around the present, conceived as the remembering imagining system (Conway, Loveday & Cole, 2016). Within this framework, spontaneous future thoughts close to the present tend to centre on specific personal planning whereas temporally distant thoughts are more related to cultural life scripts about *what other people like us* do across the lifespan (Berntsen & Bohn, 2009) or higher order goals such as autonomy, competence and relatedness (Ryan & Deci, 2017; 2000). It has long been suggested that episodic future thinking is particularly relevant to the first stage of goal-directed prospection: forming a plan (Atance & O'Neill, 2001; 2005).

1.3ii Planning and decision making. In the summer of 1971, Schank and Abelson attended a workshop which brought together academics from what the authors describe as an *ill-defined field at the intersection of psychology, artificial intelligence and linguistics* (1973, preface first page, not numbered). In the book subsequently published about this collaborative project, cognitive science is described as the common model by which the academics could advance a theoretical model explaining the knowledge system of scripts, plans, goals and understanding. In an attempt to set out the model so that it might be entered into a computer, theory is presented by means of a complex coding system. Some of the content can be difficult to understand however the concept that goals drive intentions which are enacted through an interplay of scripts and instrumental goals has enduring appeal and the text is much cited in future thinking and goal literature. Scripts are explained as automatic behaviours that unfold in situations where the actors know what is expected of them. For example, when ordering a coffee, both the customer and waiter have pre-existing scripts for how this interaction is likely to unfold. Plans are initiated by a drive to realise a goal. Plans are enacted through a combination of semi-automatic scripts and situation-specific D-goals and I-

goals. I-goals are script-like knowledge structures that allow situational flexibility. For example, you may have a script for how to make a certain recipe but an I-goal allows you to flexibly adapt that script to make that particular dish better than the next person. D-goals are described as stereotyped instrumental goals that explain how plans change in response to external events. Planboxes are slave to D-goals and are packs of action knowledge that will be enlisted by a D-goal. If you are lost and don't know your way, the action of asking someone else for directions might be the planbox to the D-goal of getting to the place where you are intending to go. As the authors note, there is a fine line in the distinction between where scripts leave off and plans kick in.

Planning has component processes which, when applied to a future event, would typically consist of four stages: the ability to imagine potential scenarios; to set long-term goals; to generate future scenarios that might facilitate these long-term goals; and to evaluate the likelihood that implementing that scenario will enable you to realise the goal (Klein, Robertson & Delton, 2010). The extent to which goals frame plans, that lead to actions, in a top-down process that functions without impediment, have been extensively examined in social psychological literature (Locke, 2018; Locke & Latham, 1990; 2002). Examples include the intention-behaviour gap, showing that conviction is not a reliable index of action (Ajzen, 1991; Sheeran & Webb, 2018); the planning fallacy that inclines people to be unrealistic about the costs of goal attainment (Kahneman & Tversky, 1979; Buehler & Griffin, 2018); and prospective memory, which is the facility to recall an intention at the critical moment so that the planned task is enacted (Einstein, McDaniel & Anderson, 2018; Kliegel, McDaniel & Einstein, 2008). Prospective memory is intimately related to human planning and future oriented behaviours (McDaniel & Einstein, 2007).

An implementation intention is a technique by which prospective memory or behaviour change can be enhanced by pre-deciding specific strategies.

An implementation intention takes the form of *if-when situation X arises, then I will perform response Y* (Gollwitzer, 1996; Gollwitzer & Crosby, 2018; Gollwitzer & Oettingen, 2013). Implementation intentions are decided upon in advance and are then brought into use when obstacles to the desired change are encountered (Gollwitzer, 1999). By contrast, goal intentions merely state a desired end point and take the form of *I intend to reach X* (Gollwitzer 1993, 1999). A future event is more likely to be remembered when planned with implementation intentions compared to mere rehearsal, (from which *if/when-then* thinking is absent) (McCrea, Penningroth & Radakovich, 2014). Generating a sincere intention to do something vs. merely thinking about future desires is likely to involve simulating alternative scenarios. By mentally pre-experiencing these, relative costs and benefits can be weighed up, allowing the selection of the most effective plan. The likelihood of a plan becoming a future action has been shown to be significantly enhanced when the individual has corresponding implementation intentions (McDaniel, Howard & Butler, 2008). By projecting yourself forward in time to sample potential scenarios, plans become more efficient and more effective and implementation intentions are reinforced.

The link between planning and future thinking goes beyond mere semantic understanding about the future, the desire for a specific outcome informs decisions about actions in the present. Oettingen and Mayer looked at the realism of future goals in an experimental study (2002). Judging a desired future as likely predicted high effort and successful performance compared to positive fantasies that were not expected to come to fruition. Merely focusing on a desirable outcome is not enough; it is the mental simulation of the process of attaining the goal that is associated with successful attainment (Pham & Taylor, 1999). Construal level theory stipulates that the temporal distance of an event affects the conceptual level of prospection, so that events set closer in time are more concrete and specific (Trope & Liberman, 2003). When events are more temporally

distant it is harder to grasp the detail but easier to think about more abstract aspects such as the goals and values activated by that event (Liberman & Trope, 2014). When events are set closer in time, the concrete, specific and contextual information is more available (Forster, Friedman & Liberman, 2004).

1.3iii Emotion Regulation. One adaptive function of the capacity to project the self into a sense of what is believed to be one's future is that this permits evaluation of the hedonic consequences of plans and actions (Gilbert and Wilson, 2007; Ingvar, 1979; 1985; Suddendorf & Corballis, 1997). Selective biases in autobiographical memory can help to promote a positive view of the self; an optimistic outlook on the world; enhance interpersonal relationships and create a sense of best-guess knowledge about likely outcomes in the future (Conway & Pleydell-Pearce, 2000; D'Argembeau & Van der Linden, 2007; Devitt & Schacter, 2018). Just as personal memories are known to serve an important function as part of an emotion-regulating self-system (Walker and Skowronski, 2009), mental simulations about future events are often used for self-regulation and coping (Taylor, Pham, Rivkin & Armor, 1998). The effective integration and regulation of emotional and autobiographical information in healthy individuals leads to positive bias when thinking about the future and is related to optimism (Carver & Scheier, 2018; Sharot, Riccardi, Raio & Phelps, 2007). However this positive skew can leads to errors of judgement.

Often the exemplars selected from memory to guide decisions about future events are subject to implicit bias: people tend to use atypical memories when simulating future plans. Unrealistic optimism refers to the tendency to overestimate the factors that could go well in the future for the self when these are thought about more realistically for other people (Weinstein, 1980). Like many biases, most people are unaware that this is the case. A neat demonstration of unrealistic optimism associated with

prospection comes from a study where neurotypical participants were asked to rate their own (vs. others') chances of developing life-threatening illness in the future. Participants were given left-ear caloric irrigation, a process known to attenuate anosognosia in clinical patients. Afterwards the same individuals were asked again to rate their chances of developing serious illness a second time and gave a significantly more realistic appraisal of their chances (McKay et al., 2013). The authors explain this finding in the context of unrealistic optimism as a type of sub-clinical anosognosia. The tendency to maintain an optimistic view of the future is hardwired and forms the bedrock of emotion regulation and self-evaluation.

Mental time travel is peppered with examples of biases. For example, the valence of events is strongly connected to the ways in which we join up our thinking about the past and future. Long before other distinctions about the subjective qualities of future thinking were raised, psychologists have long observed the tendency for people to hold a rosy view of the future (Lench, 2009; Taylor & Brown, 1988; Weinstein, 1980). Newby-Clark & Ross (2003) asked participants to recall and anticipate events cued by personal significance. The valence of personal memories was mixed whereas future events were consistently more idealised. When asked to generate negative events, latencies were greater for future events but latencies to recall positive or negative past episodes were undifferentiated. The tendency to look forward to a *rosy future* with unrealistic optimism extends in both temporal directions (Szpunar, Addis & Schacter, 2012). For example, positive simulations of future events are also considered more favourably in retrospect (Devitt & Schacter, 2018). The valence of thoughts about the future lead to encoding and retrieval processes that are subject to a liberal bias for positive information and a conservative bias for negative information. This adds to an existing literature on the *fading effect bias*. The affective intensity of negative but not positive emotional experiences tends to decay over time (Landau & Gunter, 2009).

Individual differences in emotion suppression have been shown to affect the vividness of memory and future thinking with those higher in trait emotion suppression having less vivid and detailed mental imagery for both the past and the future (D'Argembeau & Van der Linden, 2006). Individuals high in the personality dimensions neuroticism and harm avoidance experience more negative episodic memories and future projections, emphasising the strong relatedness between memory and future thinking (Quoidbach, Hansenne & Mottet, 2008). What is not clear is whether the reduced vividness of future thinking in such individuals is as a result of reduced specificity when events are encoded and thus less detail is available from memory to furnish future thoughts. Another explanation may be that this reduced ability to engage vividly with mental time travel is a self-protective cognitive style whereby the emotional content of personal past and future is minimised.

1.3iv Future thinking and wellbeing. Since future thinking is critical to processes of goal setting, decision-making and emotion regulation, it is perhaps not surprising that biases and specific difficulties with mental time travel are related to mental health and wellbeing. Many clinical groups exhibit specific biases when envisaging the future so that the (unrealistic) optimism discussed in the previous section is less evident. There may be biases that limit the accessibility of representations of possible outcomes or difficulties in reorienting to new goals should old ones become unattainable (Dickson, Moberly, O'Dea & Field, 2016; MacLeod & O'Connor, 2018). Some of the earliest research on autobiographical memory showed that when asked to generate specific memories from the past, depressed patients often cited over-general examples (Williams & Broadbent, 1986). These types of memories can be further classified into categorical (general summaries of a class of activity such as knowing what it is like to go on a picnic) and extended memories, (for example, a

weekend away), with the former more typical among depressed patients (Williams & Dritschel, 1992).

This pattern of memory retrieval has been found in a range of patient groups including post-traumatic stress disorder (McNally, Litz, Prassas, Shin & Weathers, 1994), dementia (Naylor & Clare, 2008), and autism (Crane, Pring, Jukes & Goddard, 2012). As a key resource for accessing personal knowledge and maintaining a sense of self, past experience is a critical component for orienting towards the future. Depression has long been known to impact on social problem-solving, a task that involves drawing on past experience to generate solutions to hypothetical problems (Anderson, Goddard & Powell, 2009; 2011; Goddard, Dritschel & Burton, 1996; 1997). Where the specificity of remembering is reduced in patients, mirror difficulties in generating specific future events have also been found (Williams et al., 2007), with examples including schizophrenia (D'Argembeau, Raffard & Van der Linden, 2008), bipolar disorder (Boulanger, Lejeune & Blairy, 2013, complicated grief (Robinaugh & McNally, 2013); autism (Lind & Bowler, 2010); and post-traumatic stress disorder (Brown et al., 2013; Kleim, Graham, Filhossy, Stott & Ehlers, 2015).

The reduction in access to positive scenarios about the future is not caused by impaired future thinking *per se* but relates to specific difficulties accessing positive future representations for the self. In one early study of this phenomenon, patients who had recently attempted suicide were shown to differ from non-depressed controls in the number of positive future events they could imagine for themselves but not for other people (MacLeod & Conway, 2007, study 2). Recent research suggests that depressed individuals are able to nominate future goals and ascribe importance to these but see these goals as difficult to achieve and unlikely to occur for themselves (Dickson, Moberly & Kinderman, 2011; Thimm, Holte, Brennen & Wang, 2013). MacLeod (2017) posits that the lack of

specificity in mental time travel leads to a reduction in positive affect when simulating a future event and concurrently a reduction in goal orientation because the reduced specificity of the representation is missing positive components that typically enhance salience, motivation and drive. New research has found promising utility in employing a future episodic specificity intervention as a means by which to improve moderately and highly depressed individuals' estimates of positive events occurring in the future (Boland, Riggs & Anderson, 2018). Another new direction for research on future thinking bias in patients comes from the argument that future thinking is generally less episodic than memory to the extent that Klein (2013) questions if it is even possible to pre-experience an event in the same way as a memory can be revisited. MacLeod (2017) concurs that future thinking is likely to contain semantic as well as episodic memory components and has suggested that the word cue techniques used to generate memories might not be equally effective in generating specific future representations among patients (pp.140–141).

1.4 Anticipation. Klein (2016) points out that research on mental time travel over the last ten years or more has characterised episodic future thinking as a system by which episodic memories and semantic knowledge are recombined to conceive a possible future, with the experiencing component delineated as autonoetic by Tulving (1985) receiving relatively little attention. Although the past is validated by experience, the future is not. Memory-based accounts of future thinking may not be enough to explain the nuanced appraisals that can be made about possible future events. We may not know the future but we live as if we do. People can report not just their beliefs, hopes and expectancies for the future but also the subjective qualities of their anticipation for such events both in terms of what they think the event should feel like but separately, also how it feels while they are pre-experiencing that event. For example, feelings associated with an anticipated event were it to take place have been described as qualitatively different to the anticipatory

feelings that are pre-experienced in the present moment when imagining that event unfolding (Van Boven & Ashworth, 2007).

Although the past makes a convenient comparison point in that it is assumed to establish some ground truth about what is real in a person's life, anticipatory feelings about the future can feel more real and more directive of current behaviour than remembering past events. One aspect of research that has received relatively little attention centres on the question of how it is that anticipated feelings and subjective experience when projecting forward to pre-experience the future feel so real (Dalla Barba, 2000). In daily life, plans and decisions are made on the basis of representations of a future that is, at best, only probable (Klein & Steindam, 2016). This somewhat overlooked aspect to mental time travel has led researchers to turn to the questions of how memories can be brought to mind and subjectively experienced even when they are not believed to be true (Justice, Morrison & Conway, 2012; Justice & Smith, 2018). This has obvious parallels with the puzzling question of how it is that representations of the future can be judged and believed to be unlikely, likely or true (Ernst & D'Argembeau, 2017; Lehner & D'Argembeau, 2016).

1.5 Belief. The experiential component of recalling a memory can persist even when memories are no longer believed to be true (Foley, 2015). Differences between non-believed memories and believed memories have led to nuanced considerations. Non-believed memories are less linked to other autobiographical memories and tend to be rated (after invalidation) as less personally plausible. In line with Klein (2016), it has been suggested that recollections can persist in the absence of belief because the experiential component is a judgement made separately to the judgement of belief in occurrence. Foley draws on memory science, literary diarists and the records of historians to demonstrate sub types of impossible memories that retain their warmth and intimacy in the face of

factual contradiction. These non-believed memories are distinguished from illusory memories of the type sometimes experimentally induced in psychological research studies, where people come to realise that their beliefs about an event are not true (for example, after contamination from a co-witness, seeing a doctored video or photograph or through suggestive questioning).

Three clusters of impossible memories demonstrate the persistence of phenomenology in the absence of memory belief (Foley, 2015). Pseudo memories are spontaneous episodic memories, often stemming from childhood, that are subsequently invalidated after some event or realisation renders the event impossible. For example, Siri Hustvedt (2012) describes a detailed emotional memory from childhood that took place in a house that she subsequently realised was not built until years later. Although the memory is impossible, the associated subjective recollection is defended by the writer, who comes to decide that the memory was an amalgam of other (real) events. Another kind of impossible memory, the post-memory, is drawn from historical texts (Hirsch, 2008; 2012). Post-memories can occur where traumatic witness accounts or vicarious experience of trauma can lead to representations of these events that feel like real memories. Memories described by a child holocaust survivor to her child were later described as more vivid and real than the child's person's own childhood memories. The vicarious experience of trauma can also lead to prosthetic memories, which can be installed through exposure to media or interactive museum exhibits. Memories can take on the features of autobiographical experience so that the boundaries between experienced memories that have been lived and those that have not been lived can blur so that the subjective experience becomes a stand-in for eyewitness recall (Landsberg, 1997; 2004; 2009).

This consideration of the fallibility of memory serves to demonstrate the extent to which important memories can be accompanied by a sense of

veridical familiarity without ever having been personally experienced. Thus belief in occurrence is not a prerequisite for a memory to be integral to a person's autobiographical sense of self. Just as important personal memories may be acquired without experience, future events that have not and may not ever happen can be summoned and described as significantly personally important, subjectively different, and even self-defining (D'Argembeau, Lardi & Van der Linden, 2012; Hamilton & Cole, 2017; Lardi, D'Argembeau, Chanal, Ghisletta & Van der Linden, 2010; Markus & Nurius, 1986). Literature reviewed in this chapter suggests that episodic future thinking is particularly vivid when temporally close or, in the case of temporally distant events, when these are personally important. The subjective experience of mental time travel for believed and not-believed events is a central theme of this thesis, for example in study 3 where this is examined at temporal distances of two weeks and one year into the future. There now follows a review of methods used to investigate episodic future thinking. This will address the means by which mental time travel to events that vary by belief in occurrence can be manipulated in laboratory experiments.

Chapter 2
Methods of Investigating True and False Intentions

2.1 Methods used to investigate prospection

The upsurge in interest in the cognitive mechanisms of episodic future thinking from a variety of sub disciplines within psychology has led to a diversity of methodological approaches. Some of these techniques will be described, with particular focus on those relevant to the current thesis. Many active and important areas of research are not described. For example, a significant contribution to the understanding of mental time travel has come from neuroimaging studies using positron emission tomography and functional magnetic neuroimaging to investigate the neural architecture of episodic and semantic time travel (for a recent review, see Schacter, Benoit & Szpunar, 2017). As noted by Klein (2012), neuroimaging and neuropsychological data are important means by which to tease apart the relative contributions of episodic and semantic self-knowledge to the continuous experience of the self across time. Competing explanations of the constructive nature of mental time travel such as the constructive episodic simulation hypothesis or scene construction (Hassabis & Maguire, 2007; 2009) do not place much emphasis on the temporal processes of mental time travel. This is in part due to difficulties creating comparison conditions that will enable isolation of relevant neural architecture. As noted by Schacter and colleagues (2012, pp. 679–680), an in-depth understanding of the brain bases of subjective experiences associated with mental time travel is a goal for future research. Thus a more detailed summary of this literature is beyond the scope of this review at this time.

Diary studies show the frequency and characteristics of spontaneously generated mental time travel, enabling the examination of the processes by which these thoughts come to mind (Foley, 2018). Uncued, future

oriented thoughts have been shown to be more positive and positive thoughts are also more specific and are accompanied by more visual imagery (D'Argembeau, Renaud & Van der Linden, 2011). More than half (52.5%) of recorded future thoughts in a day centre on planning an action (D'Argembeau et al., 2010). The same study examined the importance of future thinking for decision making and goal-setting (17.5% and 11% respectively). Thoughts about the future are as common as spontaneous autobiographical memories in daily life but are more positive and idyllic in valence (Berntsen & Jacobsen, 2008). Other evidence suggests a range of themes in thoughts about the future with preoccupation with family forming the largest proportion (24.5%), followed by work (22.5%) then leisure (11.5%), romance/sex (10.5%), health and physical fitness and money (both 10%) and social relationships (9%) (Quoidbach, Hansenne & Mottet, 2008). At 30 years, participants were slightly older than many studies using student participants, which might have influenced the predominance of family over other event types. In this study the quantity of events was elicited using a verbal fluency paradigm (MacLeod & Byrne, 1996) where participants were cued to different temporal distances and were asked to report as many items as they could within a specified time frame.

2.2 Cues

Behavioural studies have included research designed to pinpoint developmental changes across the lifespan in mental time travel. The finding that the capacity to be able to answer questions about yesterday at the same developmental stage that children can conceive of their plans tomorrow was one of the earliest ways in which mental time travel began to receive research attention. The ability of children to engage in mental time travel has been investigated by asking participants to imagine scenarios centred around thirst, cold and hunger. Three, four and five year olds were asked to select items relevant to these states from sets of three objects (Atance & Meltzoff, 2005). By extending this experiment to

introduce semantically-related choices, performance in three and four year olds was reduced but five year olds were able to discriminate relevant items, indicating an enhanced ability to anticipate their own psychological states. Younger adults recall more specific details about past and future episodes compared to older adults (Cole, Morrison & Conway, 2013). Some evidence suggests this is particularly difficult when events are set in the future (Rendell et al., 2012).

Future thinking has been estimated to be inherently more semantic and less episodic than recalling the past (Addis, Wong & Schacter, 2008; Addis, Musicaro, Pan & Schacter, 2010). These studies assessed cognitive performance in older and younger adults by using an adapted version of the autobiographical interview (AI) in which individuals recall past and future personal experiences in response to probes. Interviews are transcribed and analysed by separating internal details (*who*, *what*, *why*, *where*, *when*) from external details (semantic facts, elaborations or details being related to other events). Using this method, older adults typically produce fewer internal details (Abram, Picard, Navarro, & Piolino, 2014; Schacter, Gaesser & Addis, 2013; Anelli, Ciaramelli, Arzy & Frassinetti, 2016; Lyons, Henry, Rendell, Corballis & Suddendorf, 2014; Terrett et al., 2016; Devitt, Addis & Schacter, 2017; Lapp & Spaniol, 2017).

This finding is sometimes suggested to reflect age-related deficits in executive processes, although it could be argued that the results are shaped by the measure employed. There are adaptive benefits to a system by which as life experience increases, processes of mental time travel are streamlined. Highly detailed episodic recollection would be costly were it to be performed on the basis of every related instance from past experience. Nevertheless, it is prudent to consider the age of participants for reasons beyond possible differences in executive functioning. The studies reported in this thesis aim to tap into processes of thinking about past experience and truly anticipated goals and plans. In

doing so, the distance of the horizon and what lies on that horizon are salient issues. There comes a tipping point in a long lifespan where the subjective sense of lived time exceeds the subjective sense of to-be-lived time, so that the past is represented by a bigger and more crowded canvas than the future (Carstensen, 2006). Socioemotional selectivity theory describes how it is not physical age so much as the perception of how much lifespan is left and the ability to monitor that horizon that influences goal cognition in later life (Carstensen, Issacowitz & Charles, 1999). Interestingly, this finding has also been extended to younger people who perceive that they have a limited life span, for example AIDS patients before the advent of effective treatment (Carstensen, Fredrickson, Krantz, Siegler & Vitaliano, 1998). There is also evidence for a developmental shift towards positivity in older people's autobiographical memory, working memory and attention processes (Carstensen, Mikels & Mather, 2006) and a partiality for emotionally positive vs. negatively valenced information (Charles, Mather & Carstensen, 2003; Mather & Carstensen, 2005; Reed, Chan & Mikels, 2014). This positivity effect is in contrast to a comparatively greater sensitivity to negative stimuli in young adults (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Cacioppo, Gardner, & Berntson, 1997). Thus age-related differences in mental time travel are subject to valence as well as specificity effects.

Just as the accessibility and detail of memory are differentiated by development, orientation of personal goals in prospection also changes across the lifespan. When the future is perceived to be open ended, a perspective more common in younger than older people, goals are more likely to centre on the acquisition of knowledge or novel experiences in general (Carstensen, 2006; Reed & Carstensen, 2012). When the future is perceived to be constrained, goals are more likely to be related to emotion regulation and a preference for deepening existing social bonds. Carstensen (2006, p. 1914) acknowledges that younger people sometimes

pursue goals related to social networks and older adults can pursue goals related to broadening their horizons or learning new skills but the salience of these goal types differs between younger and older individuals. Recent research in which age-related goals were experimentally manipulated between young and older adults had no effect on the specificity or vividness of mental time travel (Lapp & Spaniol, 2017). Results from a follow up questionnaire supported the premise that goal themes change in importance with age, but in this study, the themes were imposed by the experimenters. On this basis, the authors suggest that studies that allow for individualized selection of goals and using more elaborated cues would be useful avenues for future research in goal-oriented prospection. In study 4 of this thesis, goals were experimentally manipulated by temporal distance (2 weeks, 1 year) and by personal salience where participants selected events that were or were not anticipated to take place in the future. In the experimental studies that form this thesis, a novel paradigm is used in studies 1, 3 and 4 in which event cues are presented that have been validated as plausible events that are frequently experienced by participants. In order to do this, age restrictions were imposed in order that events would be controlled for salience and goal-relatedness. Pilot studies were used to obtain evidence of the types of events that were seen as plausible, easy to imagine and frequently experienced by cohorts of students and school pupils and are reported in studies 1(a), 3(a) and 4(a).

Temporal proximity affects the specificity with which an event is pre-experienced. Temporal construal theory states that individuals are egocentric so that projections into the past and future are defined by the sense of self in the here and now. Travelling in time involves mental construal so that the further away an event is in time, the less real and detailed a mental representation of that event will be (Liberman and Trope, 1998; Trope & Liberman, 2003; 2010; Spreng & Levine, 2006). When considering the costs and benefits of future actions, distant events will be

assessed on the basis of perceived benefits whereas any attendant drawbacks of events are more evident and salient when events are set closer in time (Eyal, Liberman, Trope & Walther, 2004). When people are asked to think of important events in the future or the past, temporally distant memories or projections are more likely to map onto cultural scripts about normative life events (e.g. starting school, first friend, settling on a career, having children), (Berntsen & Bohn, 2009; 2010). Chronesthesia, the awareness of a subjective sense of temporal distance (Tulving, 2002b) can be manipulated by retrieval style. People feel closer to a past event if it is retrieved by imagining a string of related events working backwards in time from the present compared to imagining the target and then a string of related events going forward from the memory towards the present (Lam & Buehler, 2009).

When investigating mental time travel, experimental cues are often taken from previous research, which has the advantage of making results more directly comparable. However, closer examination of cues can beg the question of whether they engender genuinely anticipated representations of the future, which is the focus of the research in this thesis. To give one example, events used by McDermott and colleagues (2016) were anticipated to be salient for experienced past and plausible future activities when employed by Rice & Rubin (2011) and were originally taken from Nigro & Neisser (1983). The events were: *being in a group performance*; *demonstrating a skilled act to a child or a friend*; *giving an individual public presentation*; *having a face-to-face conversation*; *in an accident or near an accident*; *running for exercise*; *studying*; *swimming*; *walking or running from a threatening situation*; and *watching the news on television*. Each event cue was paired at random with a time cue, which instructed participants either to remember a personal event (past) or to imagine a plausible personal future event (future). First person perspectives were associated with greater (p)re-experiencing and clarity of people. The authors compared these results with previous research that examined

events cued by an instruction to think of events set this year or next year (no event descriptions were given) where a greater proportion of first person perspectives were reported and noted that the kind of events used as cues may have impacted on the results. When remembering or forecasting are experimentally cued, the salience of these cues should be carefully considered if these are intended to elicit real memories or personally plausible future events. For example, the extent to which *being in a group performance* is salient or plausible to all participants is not made clear in the study just described.

Prospection has been posited to be more effortful in the construction of a not-experienced scene (Buckner & Carroll, 2007; Hassabis & Maguire, 2007; Schacter et al., 2007; Szpunar et al., 2007). However evidence suggests that future thinking can be demonstrably rapid and fluent when unconstrained by temporal distance and the imageability of cues (Anderson, Dewhurst & Nash, 2012). The process of identifying and isolating a specific episode in the past places demands on executive processes that are less well understood in future thinking. Explanations of episodic future thinking as semantic memory construction seem to depend on the notion that the imagined future has not received the verification that comes about as a consequence of experience. However this semantic explanation does not account for the finding that people are easily able to endorse future events as 'real' on the basis of belief in occurrence (Ernst & D'Argembeau, 2017).

2.3 Reality monitoring criteria, real and imagined events

The process of pre-experiencing a future event has been suggested to draw on past experience in a manner that flexibly extracts and re-combines elements of previous experiences. According to this hypothesis, some of the vulnerabilities of episodic memory, such as memory distortions and illusions, may be attributable to the role of the episodic system in allowing simulations of the personal future to be created by

flexibly drawing on elements of the past. As noted by Devitt & Addis (2016, p.107), the nature of an imagined scenario has an influence on its subsequent memorability, and can also contribute to the formation of distortions in memory. Learning more about how future representation are constructed lies in understanding how we construct the past, "while bearing in mind that the past may in turn be a product of our imagination".

Reality monitoring theory distinguishes experienced memory from invented memory by a greater amount of sensory and contextual details (Johnson, 1988). The reality monitoring framework suggests that individuals implicitly use phenomenal characteristics of a memory as a checking guide to decide that an event is true. Reality monitoring criteria have been applied to witness testimony coding memory reports of witnesses for detail, a process known as interpersonal reality monitoring (IRM). This leads to the hypothesis that true accounts of experienced events contain more contextual, temporal and auditory details and are more detailed than fabricated accounts (Memon, Fraser, Colwell, Odinot & Mastroberardino, 2010).

Another application of reality monitoring criteria has been to look at the characteristics of true recall when considering how to detect deception (Colwell, Hiscock-Anisman, Memon, Rachel & Colwell, 2007). The extent to which reality monitoring criteria have been found to be indicative of deceit in statements about past events was examined in a meta analysis of deception studies (Vrij, 2008, p. 278-9). In these data, heightened sensory information in truthful accounts was well supported, particularly in terms of spatial detail. To a lesser extent, truthful accounts tend to contain more visual and auditory details. Deceptive statements are associated with more cognitive operations (fairly well supported). Truthful accounts are perceived to have more clarity (slightly supported). Verbal cues to deceit include more negative statements, more immediacy, shorter responses and less plausible answers. In study 1(c, d) of this thesis, true

and imaginary accounts of past and future events are assessed by judges with and without contextual information to examine the effects of context on likelihood and plausibility judgements of real and imagined events from the recent past and future.

2.4 Plausibility

The list of distinctive characteristics of episodic future thinking is still evolving. The distinction between plausible and implausible future thinking is one such area of interest. Noting that some amnesic patients show poor ability to generate plausible or implausible future events compared to controls (Hassabis et al. 2007), Szpunar (2010) points out that research is needed to determine if there are any real differences between plausible and entirely fantastic events set in the future. The cognitive mechanisms of plausibility have been investigated within episodic memory literature, for example, plausible events are more easily remembered (Sharman & Scoboria, 2009). Plausibility operates as a credibility heuristic: the plausibility of an event increases the latency to decide whether or not the event has happened to you (Mazzoni, 2007). Implausible events (e.g. *have you ever witnessed a demonic possession?*) give rise to shorter latencies to respond because the search through autobiographical memory will only be run if an event is deemed sufficiently plausible. Mazzoni (2007) distinguished between autobiographical beliefs (most people know when and where they were born but have no memory of the event) and plausible autobiographical events (most people agree that choking on a small object as a young child is a plausible event, regardless of whether or not this happened to them).

Plausibility, belief and memory are partially independent but operate within a predictable hierarchy where memory cues belief, belief implies personal plausibility and personal plausibility leads to an assumption of general plausibility (Scoboria, Mazzoni, Kirsch & Relyea, 2004; Sharman & Scoboria, 2009). If you have a memory for an event, you will believe that

the event is true, the event is therefore personally plausible for you and thus it is also globally plausible for other people. Reversing this model, a memory search for an event will not be carried out if the target is globally or personally implausible. If you are asked if you remember being lost in a shopping centre, a memory search will be performed since this is a plausible event. If you are asked if you remember witnessing a demonic possession, the implausibility of the event will be a sufficient basis from which to say no, without performing a search through memory. However, plausibility is subject to contamination, for example asking someone to briefly visualise an implausible event (having a piece of skin removed as part of a routine medical procedure as a child) increases their belief that the event happened to them (Mazzoni & Memon, 2003), a process known as imagination inflation. Sharman & Scoboria found that imagination inflation can influence confidence that a false memory is true, regardless of the plausibility of the event (2009). The processes of plausibility assessment in relation to prospection are little understood. The Clinton example outlined in Chapter 1 suggests that it is possible for an event deemed implausible by the wider world to have been accepted by Clinton as a plausible memory, perhaps through the process of imagination inflation. However the mechanisms by which the plausibility and likelihood of events are judged by other people are not explained at all by existing theoretical models of plausibility. In study 1 (c, d), judges rated transcripts of believed and not believed events set in a two-week boundary around the present for hallmarks of perceived plausibility and likelihood. These two studies provide an exploratory investigation of how judges with and without contextual information make credibility assessments on the content of other people's descriptions of personal events set in the past and future.

2.5 Deceptive intentions

A new direction for episodic future thinking research has been the idea that it might be applied to the detection of deception (Granhag & Knieps,

2011). If malicious intention could be identified through structured interviews, this has potential application in the prevention of a range of criminal activities. One example is a case that occurred in September 2008, at a university in Western Finland, cited by Granhag & Knieps (2011). Student Matti Juhani Saari, shot and fatally injured ten people with a semi-automatic pistol, before shooting himself in the head. He later died in hospital. In the weeks leading up to the incident, Saari had posted videos on YouTube, including one where he could be seen firing a handgun at a local shooting range accompanied by the quote *Whole life is war and whole life is pain*. *And you will fight alone in your personal war*. Finnish police were alerted to the videos in an anonymous tip-off and visited Saari the day before he carried out his crime. Officers searched the house and questioned the suspect but no further action was taken. On balance, the officers reasoned that Saari did not have a criminal record, held a recently-obtained permit for the weapons in his home and thus was probably not a risk to others or himself. If officers had access to a protocol by which a suspect could be interviewed and a more accurate risk assessment made, in this situation several lives might have been saved.

Another example is Anders Behring Breivik who planned and executed a complex crime resulting in mass murder with 77 victims. According to reports in the Sunday Telegraph in 2011, Breivik had been flagged up to the authorities in advance of his crime by reports of multiple online purchases of bomb-making equipment. The need to detect deception about future events and foil plots before they are carried out is far from unusual in police and security settings and increasingly so as security services rely on a range of sources of intelligence to assess threat. In another well-publicised case cited by Clemens, Granhag, & Strömwall (2011), terrorists planned to detonate liquid explosives on board ten passenger planes travelling from the United Kingdom to the United States and Canada. On this occasion, the plot was intercepted and foiled by British Police. Granhag & Mac Giolla (2014) provide a summary of how

identifying hallmarks of true and false intent might be useful in a range of criminal contexts.

It is easy to see how the application of an interview protocol to detect deceptive statements would be desirable. However the ability to detect detection is an elusive goal. The literature on deception detection goes back decades with the consistent finding that liars are detected with reliability at just above chance: the figure most cited is 54% (Bond & DePaulo, 2006; Vrij, 2008). The vast majority of these studies have focused on deception about past events. While the detection of deception for criminal activities set in the future events has clear utility, the risk of a miscarriage of justice is high. There is very little evidence for hallmarks of veracity when events are set in the past. For deception detection techniques to be applied to future activities and reliably employed in real world settings, the mechanisms of veridical intention should be clearly understood and well supported by psychological science (Granhag, 2010). As noted by Tulving & Szpunar (2011), the future exists only in the human mind.

The tactic of embedding lies in otherwise true content is not unusual (Leins, Fisher & Ross, 2013) and can be particularly difficult to detect (Vrij, 2008). The extent to which lies about future activities may be embedded in descriptions of truly anticipated events is not known but it seems likely that expectancies about the future will be used to structure a future oriented cover story. A stated aim of research in deception detection is to seek hallmarks of true intention within representations of future events (Granhag & Mac Giolla, 2014). The majority of the research in this thesis is not directly related to deceptive behaviour, with the exception of study 5, but does compare believed future events with events that are not believed but are equally plausible, frequent and easy to generate in verbal and visual representations (Studies 1 and 3). By examining prospection for believed events and obtaining insight into differences between how people

represent things they intend to do and things they do not intend to do in the future (at a distance of two weeks or one year; study 4) or when comparing recent past and near future (at a distance of up to two weeks; Studies 1 and 3), this thesis contributes useful evidence to a literature that seeks to understand what happens when someone deliberately relays misleading information designed to conceal their true intentions.

Early studies looking at credibility assessments of true and false future intentions used a range of designs. The first such study employed a field design where travellers were recruited at an airport. Participants were randomly assigned to tell the truth or to lie about their forthcoming trip. A second interviewer then approached and questioned each person (Vrij, Granhag, Mann & Leal, 2011). Responses to nine questions were transcribed and coded to yield five dependent variables: response length, amount of detail, plausibility, contradictions, and spontaneous corrections. The number of details in responses did not differentiate truth tellers from liars but liars' statements were judged to be markedly less plausible. On the basis of plausibility ratings made by judges, truth tellers (72%) and liars (74%) were correctly classified; a result that far exceeds the 54% discriminative ability of past research. No more correct classifications of truth tellers and liars occurred on the basis of plausibility scores, contradictions and spontaneous corrections together than on the basis of plausibility scores alone. However, the question of how judges rated plausibility remains to be clarified. This field design has been extended and replicated and is referred to as the Portsmouth method (Granhag & Mac Giolla, 2014). Study 5 of this thesis also investigates perceived plausibility as a discriminator of intended and not intended future events with a particular focus on the reliability of plausibility judgements.

The next study to investigate true and false future intentions compared these with true and false statements about past events (Vrij, Leal et al., 2011). Participants were military police and police officers who acted as

undercover agents. Their task was to plan and undertake a mission to collect an item from building A, deliver it to building B and then return to base. While carrying out this task, participants were intercepted and interviewed by friendly or hostile agents: once on the way out (future) and again on the way back (past). During these interviews, liars gave a cover story, truth tellers told the truth. Consistent with Vrij, Granhag et al. (2011), results showed that there was no difference in the number of details in interview transcripts. However raters (N = 99) found that liars' statements about future actions were significantly less plausible than liars' statements about past actions. False future statements could be detected with 70% accuracy whereas deceptive statements about past activities could only be identified with 50% accuracy, in line with previous deception literature. The amount of detail did not differ between true and false future statements (but did differ in past statements). However detail alone could not differentiate false statements about past events above chance. Plausibility significantly differed by temporal direction (past, future) and veracity, but truth and lie detection were easiest in the intentions statements and hardest in the past activities statements, where accuracy rates for both lies and truths did not differ from chance. The authors hypothesise that observers may not expect statements about future intentions to be detailed but plausibility would still be evident. They suggest that in future research, judges should be asked an open question about why they made the veracity judgements that they did. Judges in studies 1(c, d) viewed statements about believed and not believed events in the recent past and future and made comments about what informed their plausibility and likelihood judgements in each temporal direction (see Appendix F).

A new direction for this research was taken by using episodic future thinking as an index of true and false intentions (Granhag & Knieps, 2011). Participants rated mental imagery during the planning phase using an adapted memory characteristics questionnaire (D'Argembeau et al., 2004; 2006). Half the student participants planned to place a memory stick

containing illicit material on a particular shelf in a shop in a shopping mall. In addition to planning the mock crime, participants were told to plan a cover story based on a shopping trip, which should be used if they were intercepted. Control participants were told to plan a shopping trip to buy items from the same shop. All participants were instructed that they had a single opportunity to carry out the task and ten minutes to plan the activity. After the planning phase, participants visited a second room, ostensibly to be given a tram ticket. Here they were intercepted by a second researcher an asked to imagine they had been stopped by a guard at the shopping centre. An interviewer blind to experimental condition questioned participants on their intentions. On the basis of word counts performed on interview transcripts, truth tellers said more than liars during the interviews. Phenomenological ratings on the planning phase indicated that truth tellers reported more a greater sense of mental time travel, greater clarity of temporal information and spatial location of people but no difference was found in sensory details (visual, auditory, smells/tastes) or other spatial contextual detail. This procedure has since been much replicated and is sometimes referred to as the Gothenburg method (Granhag & Mac Giolla, 2014). Study 5 of this thesis makes use of the Gothenburg method to examine intention, strategic interviewing and the use of drawings as a dependent variable.

The Gothenburg method has been used in multiple studies as a reliable means by which to examine episodic future thinking for events planned to be carried out in the immediate future and compare differences between liars and truth tellers (Knieps, Granhag & Vrij, 2013a; Knieps, Granhag & Vrij, 2013b; Knieps, Granhag & Vrij, 2014; Sooniste, Granhag, Knieps and Vrij, 2013). Other theoretical approaches that have been investigated as likely sources of difference between true and deceptive intentions have included implementation intentions (Mac Giolla, Granhag & Liu-Jönsson, 2013), spatial and temporal details (Warmelink, Vrij, Mann, Granhag, 2013), spontaneous thoughts (Mac Giolla, Granhag & Ask, 2017a), goals

(Ask, Granhag, Juhlin & Vrij, 2013; Mac Giolla, Granhag & Ask, 2017b), externally-verifiable details (Jupe, Leal, Vrij and Nahari, 2017), groups of suspects (Mac Giolla & Granhag, 2015), and forward and reverse chronological interviewing (Fenn, McGuire, Langben & Blandon-Gitlin, 2015). Results of these and other studies (Sooniste, Granhag, Strömwall & Vrij, 2014, 2015) have centred on hypotheses that i) increasing cognitive load will be more difficult for liars than truth tellers; ii) unanticipated questions on how the planned action will be carried out are answered in more detail by truth tellers; and iii) liars may be exposed by the content of their answers to unanticipated questions about their intentions. These approaches to discriminating the veracity of events that are set in the future (and thus have yet to take place) are now the subject of attempts to create a training protocol for use by police investigators (Sooniste, Granhag & Stromwall, 2016).

These studies seem to hint at the existence of some discernible differences between true and deceptive statements about future events. Deceptive statements about future events in these studies were found to be less plausible and to contain fewer spatial features (Vrij, Leal et al., 2010; Vrij, Granhag et al., 2011). Most notable of these is the difference in plausibility. One criticism that might be made of asking raters to estimate plausibility is that a theoretically-derived definition of what constitutes plausibility has yet to be established. Thus it is difficult to pin down the exact construct being measured. This ambiguity is reflected in inter-rater reliability for plausibility ratings in this type of research which tends to be very low, for example, $r = .41$ (Vrij, Granhag et al., 2011). For plausibility to be applied diagnostically as a reliable interviewing technique for detecting deception, elucidation of the mechanisms underlying such judgements is essential. Only then could this potentially useful finding have practical application.

This point highlights one limitation to the research reviewed here. These studies are based on field and experimental research with interesting results but without a clear theoretical basis. Results suggest that deceptive future statements do not have the same characteristics as deceptive statements about the past. They seem to contain less detail yet are easier to detect on the basis of plausibility. As previously highlighted, plausibility has been shown to be used as a heuristic for judging the likelihood of a person's own memories (Scoboria et al., 2004; 2009) but the mechanisms that underlie reliable detection of plausibility in statements made by others about future events has yet to be elucidated. The question of what raters are using to make a plausibility distinction is unanswered by existing research. For example, the cited definitions for plausibility in Vrij, Granhag et al. (2011) are *The degree to which the message seems plausible, likely or believable* (DePaulo, Lindsay, Malone, Muhlenbruck, Charlton & Cooper, 2003) and *Plausible answers: statements that make sense and sound credible and reasonable* (Vrij, 2008). Both of these definitions could be criticised for circularity and lack of clarity. Further research is needed to hone a more precise definition for plausibility before this could be operationalized as a method to examine statements about future events in psycho-legal research.

Verbal descriptions are one source of material for judging plausibility and easily the most common one. As part of a wider focus on means by which hallmarks of truly intended future activity might emerge, a recent avenue for research has been ask people to draw pictures that represent their future plans. For a recent review of drawing-based deception detection techniques, see Mac Giolla, Granhag & Vernham (2017). The use of drawings as an interview tool has the advantage that it can be employed in contexts where language barriers exist and has been suggested to be a useful method in terms of reducing cost, ease of implementation and analysis (Vrij, Leal, Mann, Granhag & Fisher, 2010). Studies 4 and 5 of this thesis employed sketch making as a means by which to investigate

believed and not believed events set in the recent past and near future (study 4) and true and deceptive future events (study 5).

2.6 Aims of current research

The primary aim of this PhD project is to investigate whether belief in occurrence moderates mental time travel to events in the past and future. The studies in this thesis examine the extent to which belief (that an event will really occur) can be shown to impact on mental time travel, memory and behavior, with a particular focus on the personal future. A secondary aim was to examine the evidence that hallmarks of belief, should they exist at all, might yield explicit verbal and non-verbal indicators that can be reliably detected through strategic interviewing techniques. Comparisons are made between recent past and near future events (studies 1 and 4), near and distant future events (study 3), intention as a mnemonic at a distance of two months (study 2) and deliberately lied-about and believed future events that take place in the immediate future (study 5).

In order to examine veridical intention and belief, a series of pilot studies was used to develop a novel method by which mental time travel would vary on the basis of belief. Recent research on detection of lies about future intentions is predicated on the notion that reliable hallmarks of truly intended behaviour may exist (Granhag & Mac Giolla, 2014). The suggestion is that mechanisms of episodic future thinking for believed future events may differ if target events are not believed to be going to occur. Such differences may parallel mechanisms for believed memories that are not an accurate record of the past. As highlighted by Schacter and Addis (2007), exploring the possible link between constructive aspects of memory and simulation of the future may help to provide fresh perspectives on such fundamental questions as why imagination is sometimes confused with memory and, more generally, why memories can sometimes be mistaken.

In study 1 of this thesis, time travel for recently experienced and imminently anticipated events was examined by asking participants to choose experimental cues that mapped onto recent experience and current plans. This method of investigating mental time travel was used in study 3 to contrast goal-related prospection for plans set close in time and at a distance of one year ahead. Results showed that believed events were experienced with similar vividness whether set in the past or future (studies 1b and 4b) or two weeks or one year ahead (study 3b).

In study 4, the same cueing method was used to experimentally manipulate belief in occurrence of recent past and near future activities and drawings were made of these events. In study 4(c) these sketches were viewed by age-matched judges and rated on measures taken from psycho-legal research. Judges showed poor agreement on nearly every measure and no differences were identified on the basis of belief in occurrence. In study 5, a mock crime paradigm was used to investigate believed and lied-about future actions in a between-group design. Again, participants drew as well as described their plans. In study 5(b) the drawings were viewed by three judges and rated on the basis of plausibility, detail and content. Ratings of detail in these drawings were reliable and showed that truth tellers' sketches were perceived as more detailed.

A separate attempt to find explicit markers of belief was made by examining memorial performance for believed events. Words encoded in the context of the future are better remembered than atemporal or past scenarios (Klein et al., 2010). Study 2 extended this finding to see if the salience of a believed event set two months in the future would act as a mnemonic. Results showed that the relatedness of word lists to an encoding scenario led to preferential recall regardless of belief in current plans.

Chapter 3 – Travelling in Time
(Studies 1a, b, c, d)

3.1 Background Literature, Objectives and hypotheses

A recent new avenue for research has been to address the metacognitive processes by which people are able to report belief in occurrence for future events, despite the objective fact that any event set in the future is by definition hypothetical and yet to be corrected or validated by experience. Ernst and D'Argembeau (2017) investigated the basis by which individuals derive a sense that an event is likely to form part of the personal future and contrasted this with believed events in the recent past. After generating word-cued autobiographical events, participants rated phenomenological qualities and reported metacognitive judgements on autonoesis, accuracy, and likelihood of occurrence for each event. Location clarity, personal importance, personal plausibility and rehearsal were the strongest predictors of belief in occurrence for future events. Knowing the exact time in the future that an event would take place made it seem more real. All events were associated with high levels of belief and the authors note that this may be an artefact of the design: neither distance from the present moment nor the importance of events was constrained. It was suggested that further research might expand the variability of belief in occurrence in both past and future events.

The first step in an attempt to investigate the effect of belief in occurrence is to consider variables that might impact on metacognitive assessments of the likelihood that a future event will occur. The notion that some future events are true has received some attention in deception detection literature (reviewed in Chapter 2). Believed and lied about events are investigated by randomly assigning participants to tell the truth or give a false cover story about a future activity. In the Gothenburg design, each

group is instructed to make plans to carry out a specific task. Truth tellers plan to carry out a task that involves navigating from where they are participating in the experiment to a library or shopping centre somewhere nearby to carry out an action. Liars have two tasks: to plan a covert action and simultaneously plan a cover story on a given theme (selected by the experimenter to match truth tellers' stories).

Results from such studies suggest that when people are deliberately lying about future events, they are less likely to form a clear mental image when planning the event, and sensory and perceptual components are less likely to bear the hallmarks of cognitive operations related to active goal pursuit. However it could be argued that this experimental design does not tap into latent processes of belief in occurrence. Even truth tellers in this paradigm have been instructed to do something that they had not previously intended to do. Liars have been instructed to carry out two simultaneous goals: to successfully carry out a mock crime and to generate and describe a cover story on a supplied theme that should sound plausible and convincing if intercepted and interviewed. Compare this to a field investigation involving an interview about future intentions, which would involve the detection of a contrast between latent veridical intention (truth teller) and concealed intention (liar). Since the cover story theme is not predetermined (by an experimenter), a liar is at liberty to embed deceptive elements within an otherwise truthful account of his or her future activities. It is likely that a liar is able to draw on a wide range of potential scenarios to furnish such an account since the future has yet to happen and is arguably open to any number of changes in plan or direction. This suggests that contrasting veridical belief with plausible but not-believed events would makes a useful starting point from which to think about what constitutes intended behaviour.

Diary studies show that speculating about the future is almost as common as remembering past events (D'Argembeau et al., 2010), suggesting that

the fluency of prospection is not overly impeded by the objective lack of external verification for imagined future events. People do not stop to specifically weigh up the likelihood of an imagined future event being objectively real, rather they rely on heuristics such as the extent to which a scenario depicting that event can be brought to mind (Kahneman & Tversky, 1982). The perceived plausibility of an emotional future event can experimentally manipulated by repetition (Szpunar & Schacter, 2013). This study required participants to combine familiar places and people in novel scenarios that varied in emotional valence. Emotional future scenarios that were imagined four times were seen as more plausible and detailed and were brought to mind with greater ease and more emotional arousal compared to the same event simulated only once. Using this method conferred the advantage of removing any effect of prior experience on estimates that an event could occur in the future but as noted by the authors (p 324), the cues employed were not designed to tap into existing belief; instead participants were asked to rate how plausible the events were. Thus the results cannot be interpreted as synonymous with belief and are not necessarily generalizable to understanding prospection for events that are truly believed to be going to occur for that person.

Tversky & Kahneman (1973) suggest that the availability of a representation is critical for the judgement of likelihood. When events are perceived as so unique that no exemplar in memory can furnish details of the event, the next step is to generate a scenario, defined as a story that leads from the present situation to the target event. The ease of construction and the plausibility of the scenario are heuristics used to decide how likely it is to happen. If no scenario comes to mind, the event is deemed impossible or highly unlikely. Conversely, if a range of simulations are available or a single scenario is particularly salient, the event in question will be deemed likely and even probable. Thus the availability of scenarios is likely to be another variable that should be considered in this type of research. Although not much is known about true belief in the occurrence of a future event, the literature reviewed so far

would suggest that personal importance, plausibility, familiarity and rehearsal of cue events (Ernst & D'Argembeau, 2017) and the ease with which events can be imagined (Kahneman & Tversky, 1982) would be likely to be variables of interest.

Where events are so frequently experienced as to be script-like, investigating the difference between events that were experienced or are truly believed to be going to occur and similar events that can be described but are not believed may shed light on the processes by which people are able to say that events represent a continuing autobiographical narrative of the self across time. One account of how past, future and present goal-related thoughts are integrated and readily available is proposed in a model described as the remembering–imagining system (Conway et al., 2016). As noted by Conway (2009, p.2307), memory facilitates the subjective sense of the self across time by endowing a sense of temporal order and supporting our sense of beforeness, afterness, newness and anticipation of the future. The heightened salience of events in a three-day window around the present acts allows the interplay of the recently experienced past and imminently anticipated future to enhance and facilitate goal related behaviour in the present moment. Temporally-close events are more vivid but tend to be rated as less personally important than more distant events (Spreng & Levine, 2006). Simulating temporally-close events leads to higher ratings for sensory variables and autonoesis (D'Argembeau & Van der Linden 2004). For example, a formal event invitation might be in your diary months ahead of time. At a distance of several months away, your behavioural commitment to this future event might only extend as far as replying to the invitation. When the event is only days away, semantic and episodic knowledge of the contingencies associated with attending the event, say a wedding, are switched on. The accessibility of a representation of the future event allows fine grain planning that makes the future experience both more navigable and more rewarding. *I have booked my train tickets*, *I know where I am staying*, *I've Googled the weather and I know what I am*

going to wear, friend X has booked a taxi for us to get from the church to the reception. Being asked if a temporally close event is believed to be true when it is close to the present is likely to be a much easier question to answer than if the event is set six months ahead. By constraining events to a two-week boundary around the present, as in study 1, personal importance would be unlikely to be very high with the advantage of increased vividness and the ability to generate a process simulation of *what*, *where*, *when*, and *how* the event will unfold (Gerlach, Spreng, Madore & Schacter, 2014).

Study 1(b) was designed to investigate veridical belief in recent past and future events. The decision on how close to the present events should be set was somewhat constrained by the types of event that participants would be asked to imagine. The predominant area of interest was how episodic memory and episodic future thinking might vary on the basis of personal belief in occurrence. Ernst & D'Argembeau (2017) measured belief in occurrence as a continuous variable without manipulating the salience of events. By contrast, in study 1(b) of this thesis, participants were explicitly instructed to select event cues on the basis that they did or did not believe the event to be something they had done (past condition), or intended to do (future condition) at a distance of two weeks around the present. The objective was to constrain simulations to two levels of veracity: 1. Believed events that represented true past experience or a future event that was believed to be going to take place at a specific time and date in the near future. 2. Not-believed events were merely imagined at a specific moment in the past or the future, without any accompanying belief that the event had or would take place. In contrast to Ernst & D'Argembeau, 2017, in which word cues were used to examine belief in occurrence of past and future events, study 1(b) investigated belief in occurrence in a within participants 2 (self-selected believed events, self-selected not believed events) x 2 (past, future) design.

Study 1(a)

3.2 Introduction

Previous research has used everyday event stimuli to compare true and fabricated memories (Justice, Morrison & Conway, 2012; 2018). In these studies, memories were cued by 16 events taken from literature that explored knowledge structures within autobiographical memory in which the frequency with which events tended to be experienced was not a variable of interest (Bower, Black, & Turner, 1979; Reiser, Black, & Abelson, 1985; Trafimow & Wyer, 1993). Some cues were items that might be daily occurrences, such as *getting up in the morning*; *grocery shopping; getting a bus*; or *getting a train*. Other items could be described as more likely to occur once or twice a year, such as *going on holiday* and *doing an exam.* Some items may be very infrequently experienced (e.g. *taking a drive; or going to the bank)* or could be more salient as familiar scripts to older rather than younger participants. Since frequency of experience of an event may affect the vividness of simulation, the present study sought to identify and control frequency of experience within a selection of cues.

A pilot study was conducted to generate a list of cues for use in study 1(b). The list would be used to enable participants in the main experiment to select two cues for prospection (one salient, one not-salient) and two cues for retrospection (one salient, one not-salient). To clarify the use of the term *salience*: a salient event would be one that a person had carried out in the last two weeks (past) or intended to carry out in the next two weeks (future). In the main experiment, participants were told a salient event should be already in the diary or they should have an existing verbal or written arrangement to carry out that activity. A not-salient event would be personally plausible and frequently experienced but just happened to be something that person was as sure as they could be at that moment in time they would not be doing for the next two weeks, or if possible for even longer. The same list of events was presented to each participant for each trial. Thus the list needed to comprise a menu from which four personally-

plausible and frequently-experienced events could be chosen purely on the basis of experience (1 past experienced, 1 past fictitious) or anticipation (1 future anticipated, 1 future fictitious).

In order to control extraneous variables such as lack of familiarity, personal implausibilty, or differences in the imageability of events, the choice of stimuli used in study 1(b) was constrained by specific requirements. First, each event on the list should be endorsed as plausible, frequently-experienced and easy to picture in the mind's eye by young adults aged 20–30. The age restriction matched the age of participants in the main experiment. Limiting participation to younger adults conferred the advantage of avoiding age effects on the amount of episodic content that might be provided in the main experiment (Cole, Morrison & Conway, 2013). Secondly, events on the list should provide a range from which items that were salient and not-salient events in both temporal directions could be selected. There may be any number of events that would be suitable for use as stimuli. The purpose of study 1a was to obtain a short list that would be fit for purpose.

Other researchers have considered the importance of personal plausibility and previous experience when comparing memories to prospection, for example Cordonnier, Barnier & Sutton (2016) looked at planning and experience for camping trips to familiar and unfamiliar locations in the past and future. Participants had planned a camping trip but the issue as to whether they also had the intention to go camping in the future was not investigated. Previous experience of camping was the baseline for comparison but if participants happened to have a pre-existing intention to go camping in the future, this might have made the future condition more salient. The extent to which having an intention to carry out an activity confers similar features to prospection as past experience lends to recall was the primary interest in the design of this study.

Generating self-relevant future events has been posited to rely on scene construction, self-connection and familiarity processes (Hassabis & Maguire, 2009). Evidence for this was obtained by asking patients with hippocampal amnesia and matched controls to generate future scenarios (Hassabis et al., 2007). A second study used the same stimuli to contrast prospection with memories in neurotypical individuals (Hassabis, Kumaran & Maguire, 2007). Cues were described as a range of commonplace scenarios from manmade to natural and from busy to isolated. The aim was to generate simulations that were unique future events (not based on memories) and which did not require creative input, (which may be more difficult for the neurologically atypical participants). Seven cues were used to generate fictitious future scenarios and 3 items were intended to cue self-referential, truly anticipated future events. Fictitious cues were *a beach*, *museum*, *pub*, *port*, *market*, *forest* and *castle*. Each item was framed in a sentence so that the participant imagined one specific instance, for example: *imagine you are lying on a white sandy beach in a beautiful tropical bay* or *imagine that you are standing in the main hall of a museum containing many exhibits*. Anticipated event cues were *possible Christmas event*, *possible event over next weekend*, *possible future meeting with a friend*. In this study, fictitious and intended events yielded similar results so that vividness and detail data for the two event types were collapsed within the reported results. The means by which event cues were selected and participants' ratings of belief in occurrence for these events are not reported.

The aim of study 1(a) was to generate a list of events that would be used as cues in study 1(b). Suitable events needed to be plausible, frequently-experienced and easy-to-imagine but not so frequently-experienced that it would not be possible for participants to select items that had not been experienced in the last two weeks or were not intended to be experienced in the coming fortnight. Suitable cue items would be used to populate a list presented in study 1(b), where 4 cues set in a two-week boundary around

the present could be chosen on the basis that two events would be believed to be true and thus were salient (1 past, 1 future) and two events would not be believed to be true and thus were not salient (1 past, 1 future).

3.3 Method

Design

The pilot was carried out in two phases. Phase 1 was a descriptive survey conducted to collect examples of typical activities anticipated to take place in the next two weeks from a UK-based cohort of 20-30 year olds. Phase 2 was an online questionnaire with two components. First participants provided lists of 5–10 activities that had been carried out in the preceding two weeks. These enabled verification that items nominated in Phase 1 as future events were also recently experienced past events. After nominating recent events, 24 events from Phase 1 were rated on 3 dimensions: frequency of experience (in any two-week period), personal plausibility, and ease of mental imagery. Items that appeared on both past and future event lists and were endorsed by judges at or above the midpoint (≥3) for frequency, plausibility and imageability were selected for use as event cue stimuli in study 1(b).

Participants

Phase 1 participants were 26 students or graduates (13 males) from England and Scotland who were recruited through personal contacts and asked to provide lists of up to 10 events anticipated to take place in the following two weeks. Twenty respondents (9 males, *M* age = 23.39, *SD* = 3.24, range 19–30) completed the first phase of the study. In Phase 2, a second group of 50 participants (21 males) aged 20-30 were recruited through personal contacts and student message boards and invited to take part in an online questionnaire. No participants in either phase of the pilot study also took part in study 1(b)

Materials and Procedure

Phase 1: A request was sent by email asking for nominations of everyday activities. Instructions requested a list of 5–10 events anticipated to take place in next two weeks. Appropriate activities were described as:

> *Specific activities that are in your diary and that you have actively planned to do during the next 14 days. Each event should be something lasts for over one hour but less than a day, so going home to see your parents would not count if that would be a visit of over 24 hours duration.*

Suitable examples were stated as: *going to a club with friends*; *having a meeting with your boss*; *going shopping with a friend*. Participants were not constrained by event type, so if *going to the pub* was a planned activity that would take place on five separate occasions in the immediate future, all events on this theme generated by one participant would be included in the data set. Further detail on the procedure for coding events is described in the Results section.

Phase 2: 24 specific events generated in Phase 1 were entered into an online questionnaire presented on Survey Monkey software (www.surveymonkey.com). Participants received an email link to the study. After reading an information sheet and indicating consent to participate, participants were asked to nominate 5–10 examples of specific events that had taken place over the last two weeks. Instructions mirrored those given to Phase 1 participants when providing near future events but amended to reflect the recent past. Next 24 events from Phase 1 were presented one event per page of the questionnaire. Each event was framed by the question *In the next two weeks how likely are you to*…? and followed by three questions: *It is plausible (i.e. not impossible) that I would do this in the next two weeks*, *I frequently do this activity in any two-week period*, *If I close my eyes, I can easily generate a mental image of myself doing this*. Agreement was indicated on a five-point scale (*definitely agree*, *slightly agree*, *neither agree nor disagree*, *slightly disagree*, *definitely*

disagree). After the events had been rated, demographic information on age, gender and English language fluency was collected. Participants were thanked and debriefed.

3.4 Results

Phase 1: 186 events anticipated to be carried out in the next two weeks were nominated. Items were sorted on the basis that the content could be generated as a memory or future event in response to that category being presented as a cue. The majority of categories generated in this way related to leisure (n = 15) with the rest split between occupation (work or university, n = 5) and life management (n = 5). Themes, categories and frequencies are summarised in Table 3.1. A second coder reviewed and sorted the events into the same categories and agreed on 86% of items. The remaining twenty-five items was resolved by discussion.

Table 3.1

Study 1(a) 186 Future Events by Theme and Frequency of Nominations

Theme (n)	**Events** (n)
Leisure (125)	Sports (17), Shopping (13), Pub (13), Cinema (11), Staying in (11), Eating out (10), Club (9), Seeing family (8), Travel (8), Going to a friend's house (5), Party (5), Meeting for a coffee (5), Live music (3), Museums and galleries (2), Other (2)
Occupation (36)	Meeting (study or work) (11), Working (9), Studying (8), Exam-related activities (6), Job hunting (2)
Life Management (25)	Domestic chores (8), Grooming and healthcare (7), Event planning (4), Financial chores (4), Flat hunting (2)

Item descriptions that did not contain markers of specific instances and might lead to less specific prospection or recall were not presented for

further rating, for example: working: *11–5 work at Greggs;* domestic chores*: vacuum whole house*). The Travel category was an example where items were often specific but was not rated further since cued events might extend to longer than one day, for example: *a trip to the Malverns for boyfriend's photography project; I am going to Amsterdam on the 5th of February and Zurich a week after that*). In the main experiment (study 1b) data collection was planned for the first semester of the academic year with a mixed student and non-student population. Further exclusions were made on the basis that items would be difficult to generalize to one or other occupation or would be salient only at certain times of the year (e.g. event planning: *booking festival tickets*).

After exclusions, 24 events were selected for rating in Phase 2. The description of each event was adapted from the examples given by Phase 1 participants but was aimed to be broad in the extent to which it could encompass a range of exemplars of that category. Two events were thematically related to life management, one each from the most frequently-nominated categories: *attending a medical appointment*; *going shopping for a specific item e.g. a computer*. Four items related to the three most nominated categories in the Occupation theme: *attending a progress meeting*, *doing voluntary work*, *going to a job interview*, and *giving a presentation*. Eighteen items related to leisure activities: *going to a friend's house to watch a film*, *going to the theatre*, *inviting someone round for dinner*, *meeting a friend for coffee*, *meeting a friend in a pub or bar*, *staying in with someone to share pizza and a movie*, *taking part in a pub quiz*, *attending a club night or event*, *a roller disco*, *a cinema trip*, *a party*, *baking a cake*, *going for a run*, *going to the gym or a fitness class*, *a kickboxing class*, *attending a burlesque night*, *trying out a new recipe*, and *visiting a car boot sale*.

Phase 2: 24 event cues generated in Phase 1 were rated for plausibility, frequency of experience and ease of mental imagery by 50 participants.

The aim of the pilot study was to identify items that could be selected by participants as cues for either a salient or not-salient event in a two-week time boundary around the present. Thus items receiving mean ratings of 1 *slightly disagree* or 2 *strongly disagree* on any variable would not be suitable for use as cues for salient trials. Endorsements of *strongly* and *slightly* at each end of the scale were collapsed to form three levels of agreement on each variable for every item (*agree*, *neutral*, *disagree*). Where mean endorsements were 3 (*neither agree nor disagree)* the item was labelled *neutral*. Items receiving a mean disagree rating on any variable were discarded (n = 14). Eight items derived from leisure categories and one occupation item received *agree* ratings on all three variables. One further item from the life management category (*try a new recipe*) was rated *agree* for plausibility and imageability and *neutral* for frequency. Since this would not preclude the item for use as either a salient or not salient cue in terms of frequency, this event was also selected for further validation.

The next step in validating the 10 events was to confirm that each item had also been nominated by Phase 2 participants as a memory from the last two weeks. All ten items appeared among nominations made by Phase 2 participants. Verbatim near future events from Phase 1 and recent past events generated in Phase 2 are presented in Appendix A. No further analyses were conducted on recent past events but see the Discussion section for further comments on how recent memories differed from near future plans. The number of nominations by category in Phase 1 and Phase 2 is presented in Table 3.3.

As a final step in validating the 10 items selected for use as cues, a mean was calculated for each rating variable (plausibility, frequency, imageability) for each event on the basis that 1 = *strongly disagree* and 5 = *strongly agree*. A global score for each event was then computed from the means of the three ratings. An independent sample t-test showed that

the 10 items selected for use in the main experiment received higher ratings for the combined variables (M = 3.95, SD = .35) compared to the 14 items that were not selected (M = 2.62, SD = .53), t(21.88) = 7.51, *p* = .001. Means for the 10 events selected for use as cues in study 1(b) are presented in Table 3.2.

Table 3.2.

Mean Scores for Highly Plausible, Frequent and Imageable Events

Description	*Means **			
	Plausibility	*Frequency*	*Imagery*	*Global*
Meet a friend for coffee	4.58	4.32	4.8	4.57
Meet a friend in a pub or bar	4.46	4.14	4.6	4.4
Stay in for pizza and a movie	4.38	4.08	3.8	4.09
Go to the cinema	4.1	3.28	4.72	4.03
Watch a film at a friend's house	3.92	3.42	4.52	3.95
Go to a club	3.68	3.52	4.44	3.88
Invite someone round for dinner	3.9	3.36	4.32	3.86
Attend a progress meeting	3.9	3.32	4.12	3.75
Try making a new recipe	3.5	3.02	4.06	3.53
Visit a gym or fitness class	3.34	3.04	4.02	3.47

Note: Raters, *n* = 50

Discussion

The aim of the study was to find a short list of stimuli that could be used to cue recent memories and future plans in a study in which belief in occurrence would vary. Keeping the list short was intended to minimise any extraneous effects of variance in the salience of events. Ten event cues were endorsed as plausible, frequently experienced and easily imagined by 20-30 year olds when thinking about the recent past and near future.

Phase 1 and 2 events. Since instructions had stipulated that suitable activities would already be in each person's diary or calendar, some Phase 1 responses included an estimate of time and date. This

information provided additional confirmation that items were real future plans. The *where* and *when* aspects of future plans were often made clear within the written content of Phase 1 nominations. By contrast, some of the past events were described in terms of personal salience rather than the physical location such as: *Met my ex boyfriend, last time I saw him was 1.5 years ago*. This memory might potentially be elicited by cues such meeting for coffee or going to a pub or bar but as the location was not mentioned, this item was categorised as *Other going out*. Many of the past events contained spontaneous activities or idiosyncratic information that could feasibly happen in the future but would be unlikely to be planned to occur. For example, going for a walk was suggested once in Phase 1. This might not be an event that is often put in the diary but if the weather outside looks inviting, you might decide to go for a walk on the spur of the moment as a way of enjoying the day. Phase 2 participants nominated this event on 9 occasions in a range of contexts from walking to the pub, walking home from work with a colleague, walking a friend's dog and short excursions to local landmarks. These were distributed across categories (the majority were placed in *Travel* or in *Other going out)*. This example highlights the difficulty of aligning prediction with real experience. An agreement to go to the pub with a friend might well become a walk to the pub with a friend if the weather turns out fine. Future plans tend to be moderated by unanticipated factors when they come to be acted upon.

Some Phase 2 events highlighted the idiosyncratic nature of memories in contrast to the schematic nature of plans. Six items were not generalizable to the future condition, for example: *went to unlock my car door and the locks had frozen; spoke to a really old man on the phone who claimed he knew John Lennon*; *was excited to find half a bag of Malteasers in my bag*; and *got presents from my friends for my birthday*. Two of these idiosyncratic events might be described as hobby projects: *spent almost an entire day drawing* and *started stripping an old tractor.* However comparable projects were not cited as existing plans among Phase 1

future events and so, although people may frequently spend time on their hobbies, this was not a category validated by nominations from both the recent past and the near future within these data. Conversely, there were two categories that were nominated as plans in Phase 1 but were not cited as recent memories in Phase 2: *theatre* and *exam activities*. In the case of exams, it is likely this is an artefact of the time of year that data were collected. If items were limited to only one temporal condition they were not suitable for use as cues.

It is worth noting that the list of events did not have to be definitive. Other cues might also be suitable for use, for example *eating out* or *shopping for a specific item*. The cues that were selected approximated the proportion of themes nominated by participants in Phase 1 and Phase 2 (the ratio was 1 occupation: 1 life management: 6 leisure). The final list comprised one item each from life management (*try making a new recipe*) and occupation (*progress meeting*) themes. The other 8 items were leisure activities with 3 items themed on staying in, 4 items themed on going out and 1 other leisure (working out at the gym or a fitness class). On the basis that the list was representative of some of the concrete activities experienced by 20-30 year olds in any two-week period and items were endorsed as plausible, frequent and imageable, the 10 items shown in Table 3.2 were used as experimental stimuli in study 1(b).

Table 3.3.

N Event Nominations from Phase 1 and Phase 2

ID	Classification	Phase 1 Future	Phase 2 Past	Total**
1.	**Occupation**			
1.1a	Meeting (study or work)*	11	10	21
1.1b	Working	9	9	18
1.1c	Job hunting	2	8	10
1.2a	Studying	8	12	20
1.2b	Exam related	6	0	-
	Subtotal	*36*	*39*	*69*
2.	**Leisure**			
2.1	*Going out*			
2.1a	Coffee*	5	4	9
2.1b	Pub or bar*	13	19	32
2.1c	Eating out	10	27	37
2.1d	Go to a club*	9	9	18
2.1e	Live music*	3	3	6
2.1f	Cinema*	11	13	24
2.1g	Party	5	4	9
2.1h	Theatre	3	0	-
2.1i	Museums & Galleries	2	2	4
2.1j	Other going out	2	9	11
	Subtotal	*63*	*90*	*150*
2.2	*Staying in*			
2.2a	Going to a friend's house*	5	7	12
2.2b	Staying in*	11	19	30
	Subtotal	*16*	*26*	*42*
2.3	*Other Leisure*			
2.3a	Sports*	17	18	35
2.3b	Shopping	13	17	30
2.3c	Travel & day trips	8	21	29
2.3d	Seeing family	8	10	18
	Subtotal	*46*	*66*	*112*
	Total leisure	*125*	*182*	*304*
3.	**Life Management**			
3.1	Flat hunting	2	4	6
3.2	Domestic chores*	8	11	19
3.3	Financial chores	4	3	7
3.4	Grooming & healthcare	7	9	16
3.5	Event planning	4	2	6
	Subtotal	*25*	*29*	*54*
4. Idiosyncratic		–	*6*	-
	TOTAL	**186**	**256**	**427**

* Category used to generate 1 cue * *Excludes events nominated only in past or future

Study 1b

Travelling in time: future intentions and past acts

3.5 Introduction

Episodic future thinking is the process by which representations of the personal future can be subjectively experienced. It is possible to think about the future in personal and non-personal contexts, for example the question *is it likely that Sydney will have a Disneyland in 50 years*? taps into semantic knowledge about the world but does not require self projection (Abraham, Schubotz & Von Cramon, 2008). Abraham and colleagues elicited episodic future thinking in this study by asking (young participants) the question *is it likely that you will still go clubbing at the age of 40?* Contrasting these two questions neatly illustrates the difference between episodic and semantic prospection. While both involve thinking about a hypothetical future scenario, only the episodic question requires the simulation of a subjective sense of what it will be like to be *you* in the future.

Given that episodic future thinking involves the generation of hypothetical future scenarios, it is surprising how little attention has been paid to the distinction between self-projection to truly anticipated events and the same process when future events are imagined at a specific moment in time but are not, in reality, really expected to take place. In the forensic literature, reality monitoring criteria distinguish experienced from invented memories by a greater amount of sensory and contextual detail (Johnson, 1988). Reality monitoring criteria applied to witness statements has led to the hypothesis that true statements are richer in contextual, temporal and auditory detail than fabricated accounts (Memon et al., 2010). Similarly, describing a specific event that is truly anticipated to take place in the future may differ from a description of a specific future event that is based on imagination. The believed event may have components that are

missing from a representation of an event that is not really anticipated to take place. Here the two types of prospection are still episodic yet one might be expected to differ from the other in the extent to which pre-experiencing the event feels veridical or true.

Recent research shows that people can identify and describe future experiences that they believe will really happen to them in the future (Ernst & D'Argembeau, 2017). Given that research comparing memories with future thinking is intended to map out the processes by which the extended self is subjectively perceived across time, it is surprising how rarely research has attempted to drill down to future representations that are believed by that person to represent real events on the personal horizon.The aim of study 1(b) was to present a menu of events from which participants would select cues that matched their own belief in occurrence, whether this was in the past or future. The subjective characteristics of future and past events were constrained by specificity (Anderson & Dewhurst, 2009) and were examined in a two week boundary around the present, since temporally close events are more likely to contain concrete details, sensory and contextual information (D'Argembeau, Renaud & Van der Linden, 2011). As described in study 1(a), event cues were validated by participants aged 20–30 years who endorsed ten specific items as frequently-experienced, plausible and imageable (Rasmussen & Berntsen, 2014).

Method

Design and Participants

True and false intentions in memory and future episodic thinking were investigated in a 2 (episodic memory/episodic future thinking) x 2 (believed, not believed) within participants design. Dependent variables for past and future scenarios generated in response to believed and not-believed event cues were self-reported phenomenological ratings of simulating the remembered/imagined events, mean latencies in seconds

to generate each scenario and word count to describe the remembered/imagined simulations.

Participants were 63 undergraduate students who took part in exchange for course credits. All indicated that they were fluent English speakers. Previous research has indicated age differences in the specificity of episodic memory and future thinking (Devitt, Addis & Schacter, 2017). To control any extraneous effects of age or cue salience and provide an approximate ceiling for cognitive ageing effects, participation was limited to students and graduates under the age of 30.

Materials

Event stimuli. Ten events generated in study 1(a) were selected for use as experimental stimuli. These were personally plausible, frequent (in any 2-week period) and deemed imageable to participants aged 18-30.

Measures. *Phenomenological Characteristics Questionnaire*

This is a 20-item scale originally based on memory characteristics research (Johnson, et al, 1988) adapted for use in episodic memory and future thinking research (Bertnsen & Bohn, 2010; D'Argembeau & Van der Linden, 2004; 2006; D'Argembeau, Ortoleva, Jumentier & Van der Linden, 2010). Participants self-rated the phenomenological characteristics of each scenario on a 7-point Likert scale from 1 (low) to 7 (*high*). The first two questions measured (p)re-experiencing the event and the perception that this involved subjective mental time travel. The mean of these scores is typically used as a measure of autnoesis in this type of research. Six questions related to sensory details (*visual*, *auditory* and *olfactory/gustatory*) or spatial context (*location*, the *spatial arrangement of objects* and *spatial arrangement of people*). Two questions probed time: the clarity of the time of day (*temporal*) and the distance in days from the present (*days*). Two questions examined affect: emotional p/re-experiencing (*emotion*) and how positive or negative these emotions were,

(*valence*). Further questions relate to *personal importance*, *desirability*, visual perspective (*field/observer*), the extent to which the story *comes in words* and the *coherence* of the story. Finally, questions were posed to obtain ratings for *task difficulty* and the self-rated *veracity* of the memory (past trials) or likelihood of the event occurring (future trials). A copy of the questionnaire is presented in Appendix B.

The Beck Depression Inventory (BDI) is a 21-item, self-report inventory of current depressed mood (Beck, Ward, Mendelson, Mock & Erbaugh, 1961). Responses are made on a scale of four graduated responses indicating different levels of depression from 0, (*I do not feel sad*) to 4, (*I am so sad or unhappy that I can't stand it*), range 0–63. The BDI is not a diagnostic tool but scores over ten are taken to indicate depression above a general response to life's ups and downs, scores of 17–20 represent borderline clinical depression, 21–30 indicate moderate depression, 31–40 severe depression and scores over 40 denote extreme depression. Previous research has demonstrated that depression is associated with reduced specificity in autobiographical memory retrieval (Goddard, et al., 1996; Williams & Broadbent, 1986) and future thinking (Bjarehed et al., 2010; MacLeod & Byrne, 1996) and to mediate a link between autobiographical memory and poor social problem solving: a task that involves generating and pre-experiencing future scenarios (Goddard et al., 1996; 1997). The measure was included to see if reduced specificity of future or past events in this sample was related to depression.

The Creative Experiences Questionnaire *(CEQ)* is a 25-item, self-report measure of fantasy proneness (Merckelbach, Horselenberg & Muris, 2001), a personality trait that is highly correlated with schizotypy (Merckelbach, Rassin & Muris, 2000). Responses on the CEQ are dichotomous. *Yes* answers are summed to obtain a total score (range: 0–25) with higher scores indicating more fantasy proneness. Merckelbach et al. (2001) report a mean score from a student population of 8.3 (*SD* = 3.9).

Previous research has indicated that fantasy proneness may contribute to vulnerability to pseudomemories (Hyman & Billings, 1998). Individuals who attain high scores on a measure of divergent thinking generate richer, more detailed representations of future but not past events (Addis, Pan, Musicaro & Schacter, 2016). Schizotypy is associated with greater autonoetic consciousness and olfactory/gustatory experiences during mental time travel (Winfield & Kamboj, 2010). The measure was included as an exploratory means by which to investigate individual differences in fantasy proneness and the fluency or verbosity of mental time travel.

Simulation variables. Previous research has shown that closing eyes during memory retrieval increases the number of visual and auditory details recalled (Perfect et al., 2008). Thus before each practice and experimental trial, participants were instructed to carry out the simulation with closed eyes and wore a pair of Sennheiser headphones, which were used to keep ambient auditory interference to a minimum. The relative difficulty of accessing a representation of the past or future can be measured by the amount of time taken to simulate the event, a method used in previous research (Anderson, Dewhurst & Nash, 2012). Time in seconds to generate each scenario was measured using a Robic SC-606 stopwatch. Immediately after each practice and experimental simulation, participants described the event. The length of statements can be used to index the richness and detail of representations. Audio recordings were made on a Sony ICD-UX80 MP3 Stereo recorder. Recordings were transcribed using literal verbatim transcription. A computer-based count of the number of words uttered (less fillers such as er and erm) was obtained.

Procedure. Participants were tested individually in a quiet room. Detailed written instructions were given and discussed to ensure participants fully understood the differences between episodic memory, imagining and future episodic thinking (the protocol is shown in Appendix C). Once the participant had understood the instructions, two practice trials were run

using the cues *going out for a meal with family or friends* and *shopping for a specific item*. Participants were free to choose which event to practice as a memory and which to use for a future simulation.

In the experimental trials, written instructions were presented explaining that a list of ten everyday events would be shown and from this list, four target events should be selected. This cued recall technique is standard practice in literature on episodic future thinking (D'Argembeau et al., 2004; 2006). The choice of events was made according to strictly delineated criteria: one event should be something that the participant had not carried out in the last two weeks (*fictitious past*); one event should be something that the participant had carried out in the last two weeks (*believed past*); one event should be something that the participant anticipated carrying out in the next two weeks (*believed future*); one event that the participant had no existing plans to do in the next two weeks or for the foreseeable future (*fictitious future*). Participants were cautioned that at no time should they reveal to the experimenter which of the events they had chosen were true and which were false.

The order in which trials were completed was randomised by the participant choosing a sealed set of instructions from an array that included three sets of 24 possible permutations for the four conditions (*believed past*, *believed future*, *fictitious past*, *fictitious future*). Using the instructions as guidance, participants followed the experimental order but did not inform the experimenter whether or not each event was believed. The participant indicated at the start of each trial if instructions should be past or future oriented. Thus the experiment was run in the order set out on the instruction slip and the experimenter was blind to belief (*believed*, *fictitious*) but not to temporal direction (past, future).

The experimental trials followed the same procedure as the practice trials. After simulating and describing the event (audio recorded), participants

completed the phenomenological measure and placed the completed questionnaire inside an envelope. When all four simulations, verbal descriptions and questionnaires had been completed, participants sealed the second page of each questionnaire (which showed a numerical descriptor of belief and time condition: belief) in a second envelope, which was stored in a secure place to which the experimenter had no access. The experimenter was unaware of which experimental condition was denoted by the numerical code until recordings had been transcribed and analyses were carried out.

Finally each participant completed the Beck Depression Inventory and the Creative Experiences Questionnaire. Participants were thanked, debriefed and allowed to leave. Total testing time was 60-75 minutes.

3.6 Results

Where data cannot be assumed to be independent, for example in autobiographical memory research where individual differences may impact on performance, multilevel modelling is more suitable for analysis than traditional ANOVAs (Wright, 1998). Compared to an ANOVA, this method adds an extra error term, which constitutes the error between participants. To test the significant of main effects and interactions, one effect is added at a time and the models are then compared. A significant change in model fit as measured by χ^2 indicates a significant effect.

Manipulation checks

Belief. Believed events (M = 6.44, SD = .86) were believed to be more likely to occur than not-believed events (M = 1.84, SD = 1.31), $\chi^2(1, n= 240) = 402.69$, p = .0001. R^2 = .81. There was no main effect of time, indicating that the manipulation worked: participants sincerely believed in the likelihood of occurrence of the believed future and past events and that the fictitious events had not or would not occur.

Distance from present. Participants were restricted to events occurring or imagined within 14 days from the present. There was no main effect of time, $\chi^2(1) = 3.09$, p = .08 or truth, $\chi^2(1) = 2.70$, p = .10 on the number of days from the present that an event was estimated to have occurred. However, since the interaction term was almost significant, $\chi^2(1) = 3.45$, p = .06, exploratory post hoc comparisons were carried out and related to believed future events. In line with research indicating that temporally close future events tend to be more vivid, believed events in the future were more imminent (M = 4.88, SD = 3.70) than the point in time chosen for fictitious future events (M = 6.53, SD = 3.52), $\chi^2(1) = 6.2$, p = .01. Believed future events were also set closer to the present than believed memories (M = 6.61, SD = 4.07), $\chi^2(1) = 5.79$, p = .016. There were no differences between fictitious past and future events, which were set at a

similar distance from the present, $\chi^2(1) = .003$, $p = .96$, *ns* and this pattern also held for believed and not-believed memories, $\chi^2(1) = .02$, $p = .88$, *ns*.

Summary of results. The subjective experience of remembering or pre-experiencing believed compared to fictitious events was richer on multiple dimensions. There was a main effect of belief (believed events > fictitious events) for autonoetic, visual, auditory, location, the spatial location of objects and people, temporal, emotional intensity and valence. Believed events were more likely to be seen from a first person visual perspective. This pattern of main effects was also found in ratings for coherence, importance, desirability and the number of words spoken, all of which were greater for believed vs. fictitious events. There were main effects of time for location and word count (past > future). Autonoetic, visual, location, spatial location of people, temporal and feeling emotions variables produced significant interaction terms. Planned post hoc comparisons were conducted to examine differences in more detail, which are now reported. Descriptive statistics and main effects are presented in Table 3.4.

Table 3.4. *Means and Multilevel Modelling Statistics on the Phenomenology of Events by Time and Veracity*

	Time				*Veracity*				*Main Effects*			
	Past		*Future*		*Believed*		*Fictitious*		*B vs. F*		*F vs. P*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	χ^2	R^2	χ^2	R^2
Phenomenological ◊												
Autonoetic	4.96	1.63	4.95	1.38	5.58	1.15	4.33	1.57	81.52***	.17	.01	0
Visual	5.93	1.31	5.84	1.26	6.18	1.05	5.59	1.42	20.27***	.05	.46	0
Auditory	4.23	2.01	4.06	1.98	4.70	1.88	3.58	1.98	30.26***	.08	.62	0
Olfactory/gustatory	3.99	2.07	3.73	2.08	4.01	2.09	3.71	2.06	2.23	0	1.76	0
Location	5.99	1.41	5.50	1.68	6.23	1.09	5.27	1.80	27.94***	.09	6.94**	.02
Spatial obj.	5.23	1.73	5.03	1.87	5.53	1.52	4.73	1.97	18.96***	.05	1.13	0
Spatial people.	5.23	1.67	5.05	1.68	5.53	1.51	4.75	1.75	18.64***	.05	.91	0
Temporal	5.40	1.78	5.13	1.82	5.95	1.45	4.58	1.85	66.83***	.15	2.25	0
Visual perspective	3.26	2.37	3.18	2.29	2.85	2.22	3.59	2.38	10.43**	.03	.11	0
Emotionality	4.50	1.80	4.38	1.74	5.08	1.51	3.79	1.78	52.88**	.13	.43	0
Valence	4.68	1.37	4. 76	1.53	5.04	1.40	4.39	1.42	13.41**	.05	.21	0
Story ◊												
Coherence	4.81	1.79	4.68	1.66	5.19	1.48	4.30	1.83	24.79***	.07	.46	0
Importance	3.09	1.68	3.17	1.83	3.73	1.78	2.52	1.51	44.54***	.12	.16	0
Desirability	4.68	1.60	4.72	1.87	5.20	1.61	4.19	1.71	21.98***	.09	.04	0
Word count	255.40	164.37	220.17	127.15	260.29	169.22	215.28	118.97	18.32***	.02	11**	.01

Note: ◊ = (1 = low; 7 = high); * $p \leq .05$; ** $p \leq .01$; *** $p \leq .0001$; For all χ^2 statistics, $df = 1$, $N = 240$; Word count range 51–1120

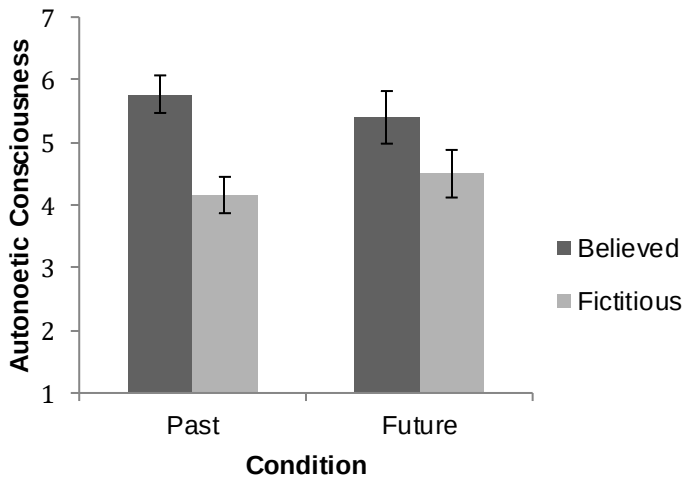

Figure. 3.1. Mean ratings for autonoetic consciousness.

Following a method commonly used in episodic future thinking and memory research, a variable for autonoesis was calculated from the mean of scores for *mental time travel* and *pre-living or reliving* (D'Argembeau et al., 2004; 2006). Figure 3.1 shows the mean ratings for autonoetic consciousness during past and future believed and not-believed (fictitious) event simulations. Planned comparisons explored significantly greater ratings for autonoetic consciousness, a defining characteristic of episodic future thinking, when events were believed to be true. In past trials, believed memories (M = 5.77, SD = 1.17) received higher self-ratings for autnoesis than fictitious memories (M = 4.16, SD=1.65), $\chi^2(1) = 49.48$, $p<.0001$, $R^2 = .24$. This pattern also found held for believed events that were set in the future (M = 5.40, SD = 1.12) compared to fictitious future scenarios (M = 4.50, SD = 1.49), $\chi^2(1) = 20.78$, p <.0001, $R^2 = .11$.

Visual. Mean scores for visual detail by condition showed that all simulations were self-rated as rich in visual imagery (Ms 5.5–6.37) and these varied on the basis of belief in occurrence. Believed memories contained more visual details (M = 6.37, SD = 0.84) than fictitious memories (M = 5.50, SD = 1.53), $\chi^2(1, 60) = 18.48$, $p < .0001$, $R^2 = 0.11$. In future trials, believed events contained more vivid visual detail (M =

6.00, *SD* =1.19) compared to fictitious events (*M* = 5.68, *SD* = 1.31), $\chi^2(1) = 3.76$, $p < .052$, $R^2 = 0.12$.

Spatial. The interaction term for location analyses was approaching significance $\chi^2(1, n = 240) = .29$, $p = .06$. Planned comparisons revealed that sense of location was stronger in believed memories (*M* = 6.52, *SD* = .72) than fictitious memories (*M* = 5.47, *SD* = 1.70), $\chi^2(1) = 20.24$, $p < .0001$, $R^2 = .14$. The same pattern was found for future events: sense of location was greater for believed events (*M* = 5.93, *SD* = 1.30) compared to fictitious events (*M* = 5.07, *SD* = 1.89), $\chi^2(1) = 8.70$, $p = .003$, $R^2 = .01$. When events were believed, sense of location was greater in the past (*M* = 6.52, *SD* = .72) than in the future (*M* = 5.93, *SD* = 1.30), $\chi^2(1) = 10.17$, $p = .001$. $R^2 = .07$. When events were set in the past, the spatial arrangement of people was clearer when events were believed (*M* = 5.83, *SD* = 1.33) compared to fictitious memories (*M* = 4.62, *SD* = 1.76), $\chi^2(1) = 21.67$, $p < .0001$, $R^2 = .13$.

Temporal. The clarity of the time of day was less clear for fictitious memories (*M* = 4.50, *SD* = 1.64) compared to believed memories (*M* = 6.30, *SD* = 1.15), $\chi^2(1) = 40.16$, $p < .0001$, $R^2 = .26$. However, in future trials the clarity of time of day was also less clear for fictitious events (*M* = 4.65, *SD* = 1.88) compared to believed events (*M* = 5.60, *SD* = 1.64), $\chi^2(1) = 17.79$, $p < .0001$, $R^2 = .07$.

Feeling emotions. The interaction term was approaching significance, $\chi^2(1) = 7.36$, $p = .007$. Planned comparisons revealed the emotions associated with each event were subjectively re-experienced to a greater extent when memories were believed (*M* = 5.37, *SD* = 1.37) in comparison to fictitious memories (*M* = 3.63, *SD* = 1.78), $\chi^2(1) = 44.93$, $p < .001$, $R^2 = .23$. This difference also extended to future trials, where the emotions that would be associated with the event were subjectively pre-

experienced more intensely for events believed to be likely to occur (*M* = 4.80, *SD* = 1.60) compared to fictitious future events (*M* = 3.95, *SD* = 1.78), $\chi^2(1) = 9.20$, $p = .002$, $R^2 = .06$. There was a main effect of belief on emotional valence, which was more positive for believed than fictitious events but this did not vary by time.

Story. Differences in story coherence, story comes in words, importance and desirability of events were related solely to veracity, with believed events receiving higher ratings than fictitious events. It took less time to generate representations of future events *(M = 63.73, SD = 31.30)* than past events *(M* = 69.21, *SD* = 34.55), $\chi^2(1) = 7.12$, $p = .008$, $R^2 = .01$). Belief in occurrence did not impact on the length of time taken to simulate events ($\chi^2(1) = .04$, $p = .85$, $R^2 = 0$). Figure 3.2 shows the mean number of words used to describe simulations. Believed memories were described in more words (*M* = 290.38, *SD* = 192.35) than fictitious memories (*M* = 220.42, *SD* = 122.51), $\chi^2(1) = 14.23$, $p = .0002$, $R^2 = .05$. In future trials, believed events were also described in more words (*M* = 230.20, *SD* = 137.55) than fictitious future events (*M* = 210.13, *SD* = 116.13), $\chi^2(1) = 14.23$, $p = .03$, $R^2 = .01$.

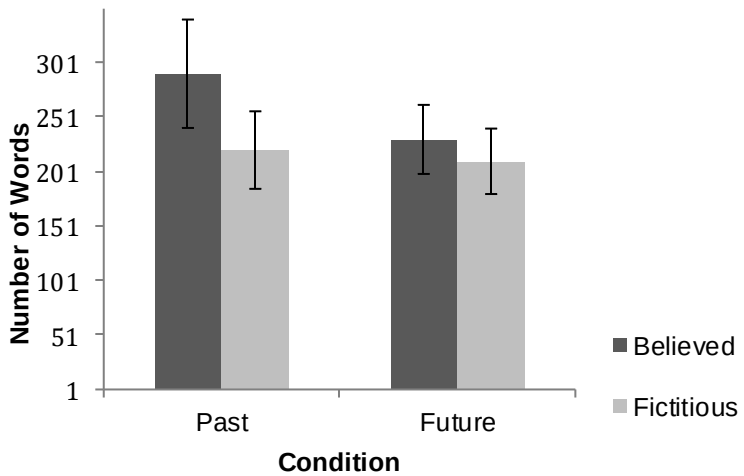

Figure. 3.2. Word Count to describe true and false past and future simulations.

Fantasy proneness and depression. Depression scores obtained using the BDI (Beck et al., 1961) ranged from 0–47, (*M* = 8.86, *SD* = 8.21). Nine participants scored 11–16 (depression above the normal range). Ten participants scored 17 or more (the cut off for borderline clinical depression). In total, 10% of participants endorsed items suggesting they were experiencing depression above a typical response to life's ups and downs. Since depression is associated with reduced specificity of memory and future thinking, scores on the BDI were entered into the model for analyses anticipated to be affected by the specificity of event representations: *autonoetic consciousness*, *visual details*, *feeling emotions*, *emotional valence*, *coherence* of story and *number of words*. However there were no differences to the pattern of main effects, interactions or model fit on any of these variables.

Fantasy proneness scores ranged from 3–19 (*M* = 10.73, *SD* = 3.69). Fantasy proneness and depression scores were correlated ($r = .31$, $p < .01$) in this sample. Since schizotypy is associated with increased autonoetic awareness and higher olfactory details in episodic memory and future thinking when events are set 6 months–1 year from the present (Winfield & Kamboj, 2010), CEQ scores were added to the model to see if this changed the pattern of results for these analyses. Autonoetic consciousness results did not differ in the direction or pattern of significance other than there was a slight improvement to model fit for the comparison between past true and past false events (R^2 increased from .24 to .27). Many of the events involved eating and drinking and these details appeared within transcripts of events quite frequently. Co-varying fantasy proneness made no difference to results for olfactory/gustatory ratings, which did not reach significance.

Discussion

In study 1(b), prospection and memory were cued by frequently-experienced, personally plausible and imageable events set in the recent past or future. Belief in occurrence had a highly similar impact on the phenomenology of mental time travel whether the event was set in the past or future. Results indicated that for these types of everyday activities, believed events were simulated with similar vividness and were described in the same number of words regardless of whether they had been experienced (past) or were not experienced but truly anticipated (future). It is not surprising that believed compared to fictitious past events were more intense, more vivid and were experienced with a greater sense of subjective recall. It is more remarkable that this pattern held when events were believed to be going to occur compared to merely imagined in a specific spatio-temporal context in the near future. Exceptions to this pattern of results that varied by belief and not by time was the physical location of each event, which was less clear in future trials. Believed future events were also set closer to the present than believed memories but there were no difference in time from the present between fictitious past and future events or believed and not-believed memories. This is in line with previous research that has shown that when past and future events are generated without temporal restrictions, future events are set closer to the present (Anderson, Dewhurst & Nash, 2012). Simulating future events also took less time than generating past events. This is in line with research demonstrating that elaboration of future compared to past events can occur with relative ease (Anderson et al., 2012; Anderson, Peters, Dewhurst, 2015).

Believed events were p/reexperienced with a more positive valence than fictitious events. Since future thinking is typically characterised by positive valence, the lack of difference between past and future trials is surprising. It could be that the extent to which events were set close in time, were

frequently experienced, easy to imagine and plausible reduced the positive valence that is typically reported when people think about the future. For example, Liberman and colleagues report an unpublished earlier study in which the distant future event *expressing friendliness* became *dialling a friend's number*, when represented closer in time: an action that is comparatively emotionally neutral (Liberman, Sagristano & Trope, 2002, p.524.) Another view is that the experience of imagining carrying out fictitious events in the future was more negative and this acted as a counterbalance to the rosy future effect. The *Undeutsch hypothesis* suggests that events that have not been experienced are described with more ambivalence, more negative statements and are less embedded in context (Undeutsch, 1967; 1989). This means of verifying differences between experienced and imagined events forms the basis of many contemporary approaches to statement validity assessment (Amado, Arce, Fariña & Vilariño, 2016). It is possible that fictitious events in the present study reflected this general tendency for imagined and not experienced events to be characterised by a less positive valence.

Returning to belief in occurrence in the present study, participants were not asked to conceal the truth when simulating and describing fictitious events. The scenarios that participants described varied on the basis that they were believed to have occurred (past) or were going to happen as described (future). Nevertheless, it was of interest to compare the results of simulating believed and fictitious (but not lied about) events with data collected from individuals who told the truth or deliberately lied about future intentions and past activities. Granhag & Knieps (2011) compared mental representations of cover stories set in the near future with true plans. There was no past condition in their study, but similar measures from the adapted memory characteristics questionnaire were used to capture the phenomenology of simulating an intended or fictitious event. True and false plans were differentiated by higher ratings among truth tellers for statement length, autonoesis, temporal information and the

spatial location of other people. No differences were found for visual, auditory, olfactory/gustatory or spatial location of objects. Contrasting these findings with near future results from study 1(b) shows considerably more variance between believed and fictitious (but not deliberately lied about) events.

Previous research has showed that judges rated deceptive statements about intentions for future activities to be less plausible, and deceptive statements about past events as both less plausible and less detailed (Vrij, Leal et al 2011). Another study reports that 74% of deceptive accounts and 72% of truthful accounts of future actions could be discriminated on the basis of perceived plausibility (Vrij, Granhag et al., 2011). When giving a cover story about a future event, individuals may be quite likely to choose frequently experienced events to hide their true intent. To see if differences in the vividness of transcripts were evident to external raters, a further study was conducted to assess the content of transcripts.

3.7 Study 1(c)

Interim summary

In study 1(a), a range of everyday events were validated by participants as plausible, easy to imagine and frequently experienced. Study 1(b) employed these as experimental cues for simulations of believed and imagined events set in the recent past or future. Believed events (*M* = 6.44) were validated as events that were believed to have happened (past) or to be going to happen in the future, compared to fictitious events (*M* = 1.84). Believed events led to longer statements and higher self-ratings for autonoesis, sensory, contextual and emotional details. In study 1(c), descriptions of these events were rated by judges on the basis of likelihood and plausibility.

Introduction

The gap between intentions and ensuing behaviour has, over many years, drawn considerable attention from researchers in the field of psychology. A recent review of a literature base that spans decades of research suggests that only 53% of intentions result in enacted behaviour (Sheeran & Webb, 2018). Similarly, the literature on deception detection going back decades has consistently shown that lies are detected with reliability at just above chance: the figure most cited is 54% (Bond & DePaulo, 2006; Vrij, 2008). The vast majority of deception studies have focused on past events. While the detection of deception for criminal activities set in the future has clear utility, the notion that future intentions are reliable predictors of behaviour is demonstrably unlikely. Early indicators that deception about events set in the future can be detected with accuracy of 70% are clearly of interest to the research community. The need to learn more about how suspects and witnesses communicate information that has not been personally experienced but which is not being deliberately concealed or lied about has been highlighted in recent research (Mac

Giolla, Granhag & Ask, 2017, p. 682). The salient condition from study 1(b) could be described as analogous to a truth teller condition in a deception study. Participants believed they were describing a true event, whether past or future. In the not-salient condition, events were not lied about but nor were they believed to be true. Thus results from study 1(c) potentially speak to researchers interested in the nuances between imagination, belief in occurrence and deliberate deception. The present study is exploratory in nature but makes a significant contribution to this emerging area of study.

Belief that an event really belongs to the personal future is related to a broader autobiographical context in which personal plausibility, personal importance and temporality (a sense of when the event will occur) are strong markers of salience (Ernst & D'Argembeau, 2017). The extent to which belief in occurrence may be apparent to judges on the basis of reading transcripts of simulation descriptions is not known. Considering next the notion of plausibility, Tversky & Kahneman (1973) suggested that the plausibility of a scenario is used as a basis for the judgement of likelihood. When events do not cue recall of a similar experience in the past, a hypothetical representation is elicited and used to compare with the target event. The plausibility of the scenario or the ease with which it was generated is then evaluated in order to decide how likely the event is. However very little is known about how plausibility is assessed in other people's statements.

It is easy to see how the application of an interview protocol to detect hallmarks of sincere intent would be desirable. Such a measure could be applied in a range of contexts, from professional to interpersonal. Assessment of other peoples' intentions are made all the time, from deciding if a romantic partner is *really* going to change, measuring the likelihood that a patient will adhere to a treatment regime, or interviewing a suspect in a legal case. Increasingly such decisions are automated in

professional contexts yet the evidence for the reliability of intentions as hallmarks of behaviour is little understood. Research shows that professional experience does not equate to expertise in deception detection (Vrij & Mann, 2001; Meissner & Kassin, 2002). The reliability of laypeople and professionals' judgements of veracity are roughly in line with accuracy if established by tossing a coin. A layperson will typically employ a truth bias when making credibility assessments on truthful and deceptive material (for a review, see Vrij, 2008, pp.163–164). A truth bias will impact on the likelihood of accurately detecting true statements in two ways. If all material is rated as true, more truths are correctly captured by positive ratings. The cost of this overall bias is that more lies are also inaccurately judged to be true. Thus a truth bias enhances detection for truth and reduces the detection of lies. By contrast, individual differences in suspiciousness are associated with holding a lie bias, which leads to a greater likelihood of correctly detecting lies but at the cost of misjudging truths also to be lies (Levine & McCornack, 1992; Bond & DePaulo, 2006). Thus a bias in either direction would impact on the accuracy of raters' assessments.

Exploratory research has employed plausibility as a marker to discriminate truthful and deceptive statements about recent past or near future activities (Vrij, Granhag et al., 2011; Vrij, Leal et al., 2011). Accuracy rates of up to 70% have been reported on the basis of using plausibility judgements to discriminate true from false descriptions of other people's future plans. As discussed in the literature review, extant literature on plausibility focuses on internal processes by which people judge their own memories. The means by which plausibility judgements are made about other people's statements are far from clear. When asking if someone else's utterance or narrative is plausible, the question being asked is *what is the possibility of this being true*? (Scoboria, personal correspondence). The extent to which this judgement can be made may be constrained by the amount of common knowledge or experience that exists between the

rater and the individual whose message is being rated (the sender). If *you* describe to *me* your journey to work today, the extent to which I might evaluate the plausibility of your description is most likely constrained by my knowledge of you or of our shared environment (my familiarity with your typical commute). Results of study 1(b) indicated that the subjective experience of remembering and imagining events set two weeks around the present moment significantly varied by belief in occurrence rather than temporal direction. Studies 1(c) and (d) were designed to capitalise on these verified (self-rated) believed and not-believed event descriptions. Judges were students at the same university and had shared knowledge of the environment and campus culture described in transcripts but were unaware that events varied by belief. Further, judges were not given definitions of likelihood or plausibility but were asked to note down what informed these ratings during each questionnaire.

Two recent studies reported by Nahari (2017) show the extent to which judge's prior knowledge about material influences judgements of the veracity of content. The material under examination in these studies consisted of short autobiographical stories (*e.g.* a diving trip, experiencing two motorcycle accidents on one day) that were validated by the story authors to be either 100% true or between 65–100% fabricated. In pre-tests, untrained judges were unable to distinguish the veracity of the stories. In the first experiment, all participants were trained in interpersonal reality monitoring criteria. Participants either knew the real purpose of reality monitoring and used their training to assess the veracity of the stories, or were misled to believe that reality monitoring is a literary criticism technique and that the task was to judge the stories for their literary appeal. A control group assessed the stories for reality monitoring criteria with no context for the task. Group differences were limited to the false stories, which received lowest reality monitoring ratings from the forensic assessors, showing that top down processes of employing veracity criteria led to a bias to identify variance on that basis.

In Experiment 2 (Nahari, 2017), the design was repeated to manipulate overall bias. Reality monitoring criteria were pared down to the four criteria that had been most diagnostic in the previous experiment; perceptual information, spatial information, temporal information and affect. This sub set is posited to encapsulate reality monitoring criteria (Nahari & Ben-Shakar, 2013) and has been employed in previous research (Mann et al., 2013; Nahari, Vrij & Fisher, 2014: Vrij, Mann, Jundi, Hillman & Hope, 2014). Two-thirds of participants were aware that reality monitoring criteria can operate as a lie-detection tool and were misled to believe either that all stories were true (biased-for-truth) or that all stories were false (biased-for-lies). One third of participants knew nothing about the purposes of reality monitoring criteria and were effectively a control group. All three groups rated true more than deceptive stories as richer in detail (mean of the four criteria) but the biased-for-truth group made significantly higher ratings for perceptual, contextual, and emotional details compared to the biased-for-lies and control groups.

These results demonstrate that training judges to use evidence-based protocols does not eliminate truth bias, adding to an existing literature on the robustness of this phenomenon (Burgoon, Blair & Strom 2008; Levine, Kim, Park & Hughes, 2006; Levine, Park & McCornack, 1999). Judgement criteria cannot and should not be applied without clear evidence that these are relevant to the judgement being made (Nahari, 2017, p.240). Since there is little literature on how plausibility of other people's autobiographical stories is assessed, least of all when these accounts are set in the future, the first phase of assessments were exploratory. Events described were typical of student life experienced at the university attended by the two judges. Thus judges had some prior common experience with statement senders. To reduce any potential for judgements to be subject to a bias to make equal numbers of high and low

ratings (Colwell, 2005), statements were presented in packages of uneven quantities of believed and not believed events.

It was of interest to investigate to what extent judges' ratings for likelihood and plausibility indexed transcript authors' ratings for belief in occurrence. A belief bias would manifest in high plausibility and likelihood ratings for all events. As an exploratory analysis, ratings were used to assign events to *likely* and *unlikely*, *plausible* and *not plausible* groups for each judge (see Method section). On the basis of evidence from deception detection literature, it was anticipated that this analysis would indicate a bias for judges to find all items likely or plausible. This exploratory analysis should be interpreted with caution since judges were not asked to make categorical ratings.

To summarise study 1(c), judges viewed and rated transcripts about past and future events that were either believed or fictitious in origin. Judges were told the events described were about things people had done in the past or would do in the future. Judges were not made aware that events varied in belief in occurrence. Analyses centred on the extent to which judges showed a bias to rate events as plausible and likely. A further question centred on whether each judge's plausibility and likelihood scales correlated (did plausibility relate to likelihood?) Where intra class correlations indicated reliability, mean scores for plausibility and likelihood judgements could be used to examine whether these measures could discriminate events that had previously been verified as believed from fictitious (but not lied about) events in the past or future. As an exploratory aside, raters were asked to log their thoughts on what made events seem more or less plausible or likely (presented in Appendix D).

Method

Design and Participants

Study 1(c) was designed to obtain plausibility and likelihood ratings for verbal descriptions of personal events from the recent past and near future. Participants were two undergraduate research assistants (1 male, 1 female) who were in the third year of studies at the same university as transcript senders. Transcript senders and judges were not in the same year of academic study. Judges were unaware that events varied on the basis of belief in occurrence.

Materials and procedure

Interviews from study 1(b) were transcribed (*n* = 252). Proper nouns were changed to protect the privacy of transcript senders. Hesitations, fillers, pauses and hedges (e.g. er, erm, like) may be seen as markers of disfluency but there is little evidence to suggest that this is an indication of credibility (Arciuli, Mallard & Villas, 2010; Vrij, 2008). Literal verbatim transcripts were presented with hesitations, laughter, and long pauses intact and indicated in the text as [erm], [laugh], [pause].

Four questionnaires were designed on Survey Gizmo software (www.surveygizmo.com). Transcript order was randomised within each temporal direction (past, future). A random number generator was used to determine the number of transcripts presented in each questionnaire. The intention was to prevent participants from developing a sense that they were being asked to make equal numbers of high and low ratings on each dimension. A table displaying the quantity, veracity and temporal order of transcripts presented in each session can be seen in Appendix E.

Testing took place in a quiet laboratory at Royal Holloway, University of London. The questionnaires were presented over four sessions, with a one-week interval between session 1 and 2 and again between session 3

and 4. The shortest questionnaires (2 & 3) were presented in the morning and afternoon of the same day. Participants sat at personal computers on opposite sides of the room. Written instructions explained that each judge should work in silence (should not confer) and that the survey was designed so they would not be able to go back to change answers but could be saved in order to take a break when desired.

Each questionnaire was preceded with the following text, items in parentheses were amended according to the temporal context (*past*, Surveys 1 and 2; *future*, Surveys 3 and 4):

> *You are going to be shown a series of transcripts where the sender is talking about an event that he or she (experienced in the recent past) (anticipates happening in the near future). Please read each transcript then answer the two questions that follow it.*

Transcripts were presented on single pages followed by two questions, which were rated on Likert scales:

> *How likely is it that the event (occurred) (will occur)?*
> *1, definitely (did not happen) (will not happen); 10, definitely (did happen) (will happen)*
> *How plausible is the event?* 1 (*not at all plausible)*; 10 (*highly plausible*)

Across each questionnaire, three comment boxes were randomly presented. Instruction text asked participants to comment on what made events sound: (*more likely*), (*less likely*), (*more plausible*), (*less plausible*).

In session one and a week later in the morning of session two, 126 transcripts of autobiographical events from the recent past were rated. In the afternoon of session two and a week later in session three, 126 transcripts describing personal events anticipated in the near future were rated.

3.8 Results

Inter-rater reliability

Intra-class correlation (ICC) showed poor agreement between the two judges. Alphas were calculated for the overall reliability of ratings when past and future events were combined and for past and future ratings separately. Overall reliablity was very low for likelihood (r = .31) and plausibility (r = .19). When rating past transcripts, ICCs were low for likelihood (r = .24) and almost at floor level for plausibility (r = .05). Agreement marginally improved when events were set in the future: likelihood (r = .38), plausibility (r = .29). However the reliability of judges' ratings was substantially below a level that would support performing further analyses on the basis of combined ratings.

Bias

To explore whether each judge had a bias to rate events as likely or plausible, ratings were recoded to create dichotomous variables. Items rated 1-5 for likelihood were recoded as *unlikely*, items rated 6-10 were recoded as *likely*. Items rated 1-5 for plausibility were recoded as *not plausible*, items rated 6-10 were recoded as *plausible*. On this basis, judges showed a bias for likelihood and plausibility in both temporal directions. Table 3.5 displays the overall positive bias (in %) shown by each judge and the accuracy with which believed and fictitious past and future transcripts were discriminated on the basis of plausibility and likelihood ratings above or below the midpoint of the scale.

Table 3.5.

Study 1(c) Bias and Accuracy for Plausibility and Likelihood of Events

	Judge	***Past***			***Future***		
		%			*%*		
Measure		*Bias*	*Accuracy*		*Bias*	*Accuracy*	
			Believed	Fictitious		Believed	Fictitious
Likelihood	1	58	51	35	65	67	40
	2	66	70	38	72	57	43
Plausibility	1	66	65	33	64	59	30
	2	75	75	25	76	76	24

Note: *Believed* shows the % of study 1(b) *believed* transcripts rated > 5 for likelihood, *Fictitious* shows the % of study 1(b) *not-believed* transcripts rated ≤ 5 for likelihood

Accuracy

Both judges demonstrated a bias to rate believed past and future events as likely to occur or have occurred. Together with the low number of fictitious events correctly discriminated as unlikely, these results indicate a positive likelihood bias in both judges. Identification of fictitious events as unlikely was more accurate in future than past trials but across both temporal directions, accuracy was below the 54% typical in deception detection literature, a figure that represents accuracy at chance.

Correlations

Each judge's ratings for the plausibility and likelihood of past transcripts were moderately correlated (Judge 1: $r = .67$, $p < .01$; Judge 2: $r = .63$, $p < .01$). This was also true when rating future event transcripts (Judge 1: $r = .77$, $p < .01$; Judge 2: $r = .61$, $p < .01$). This suggests that the perceived plausibility of events was closely related to judgements that the same events were likely or true. Raters' comments on what informed ratings can be seen in Appendix F.

Discussion

Two judges rated transcripts of believed and imagined scenarios set in the past and future that had been cued by plausible, frequent and easily imageable event cues for plausibility and likelihood. Judges were unaware of the variance in belief that existed in the authors of the scenarios but were aware of the temporal direction (past, future). Results of reliability analyses showed that there was very low agreement on what constituted a likely or plausible event in either temporal direction. Agreement was closer when events were set in the future but in neither temporal direction would alphas support further analyses. Although judges and raters shared experience about the culture of life on campus at that university, this did not seem to have conferred any advantage to recognising hallmarks of plausibility in statements about everyday events.

Previous research has suggested that plausibility can differentiate true and deceptive descriptions of future events with 70% accuracy (Vrij, Granhag, Mann & Leal, 2011; Vrij, Leal, Mann & Granhag, 2011). In study 1(b) participants were not deliberately perpetrating a deception. Fictitious events were imagined in a specific spatiotemporal context in a frequently experienced place but the event had not been experienced (past trials) or was not intended to take place (future trials). On the basis of these results, the difference in plausibility and perceived likelihood of events was not apparent. However these results cannot be said to be conclusive since reliability was very low.

Very little contextualising information was made available to judges. Since inter-rater reliability was low, this lack of agreement could have been an interesting finding had raters been able to agree on at least one dimension in these data. If this had been the case, low agreement for plausibility and likelihood would be contextualised as more likely to relate to the constructs being measured. A second rating study was planned in which two content variables taken from reality monitoring criteria would be rated alongside

plausibility and likelihood: emotion and visual detail. If raters could agree on the extent to which these phenomenological measures were evident in transcripts, these findings would provide an external measure of self-rated belief in occurrence and would provide context to the null results for plausibility and likelihood. Results could establish whether the poor agreement between raters was limited to the constructs of plausibility and likelihood used by raters when no other context was available.

3.9 Study 1(d)

Introduction

Study 1(d) reports a second rating task conducted on transcripts obtained from study 1(b). Judges were aware that the events differed on the basis of transcript senders' belief in occurrence. Judges were not given definitions of plausibility or likelihood but made notes on what informed these ratings. In addition, study 1(d) judges assessed two other aspects of transcripts: visual detail and emotional content.

When judging the content of your own memories, recollection accompanied by heightened awareness, sensory elements and detail is more likely to be believed to be true and accurate (Foley, 2018; Johnson et al., 1988; Johnson & Raye, 1981). When examining how judgements are made on the credibility of other people's statements, these self-memory evaluations have been applied to judge the source of other people's memories, a process called interpersonal reality monitoring (Johnson, Bush & Mitchell, 1998). Sensory vividness and clarity are seen as hallmarks of credibility (Colwell et al., 2007; Memon et al., 2010).

Recent research has experimentally manipulated the contributions of emotion and detail to credibility judgements made about other people's recollections (Justice & Smith, 2018). In this study, judges saw witness statements that were high or low in detail and emotion and were asked to assess how believable the statements were and separately, how reliable the content was perceived to be. Judges were told that these statements were Police evidence, thus they took the task seriously. Results showed that the extent to which statements were believed to be true did not vary as a function of detail or emotion (although the perceived credibility of witnesses was related to shorter statements). In other words, the level of detail in a statement can make a witness sound more reliable but not more

believable. Statement length was the best predictor of belief, with shorter statements the most believed.

In study 1(b), believed events in the past and future were described in more words, leading to longer transcripts. On the basis of Justice & Smith's findings, judges might misattribute credibility on the basis of statement length. However the finding that judges evaluated detail and emotion as separate constructs to belief in occurrence might suggest that examining statements for detail and emotion would not impact on judge's perception of the likelihood and plausibility of events rated in study 1(d). Certainly these aspects of statements have been shown to be easy to assess by judges in previous research (Vrij, 2008).

Nahari, (2017) showed that the application of reality monitoring criteria in a forensic assessment led to lower ratings for detail and emotion compared to the same criteria applied to a different construct (how good a story was) and a control condition (no context). In the present study, transcripts described simulations that had been validated as subjectively richer in visual detail and emotion when events were believed. In study 1(d), Judges 3 and 4 were told that events varied by time and also by belief (believed, fictitious). Judges rated four features: likelihood, plausibility, visual detail and emotionality. On the basis of reality monitoring criteria (Johnson et al. 1988; Rubin et al., 2003), it might be expected that past events containing more sensory vividness would be more likely to be judged as plausible or likely. That is, the degree to which narratives set in the past contained visual details and emotional content, the more likely they would be judged as likely to have occurred. Less is known about applying reality monitoring criteria to believed future events. It was of interest to see if judges could agree on any of the 4 dimensions when applied to past and future events. If ratings formed reliable scales, it would be of interest to see if these could differentiate believed from not-believed events. In study 1(c), a bias to rate items as plausible and likely was

evident. The accuracy and overall bias for each judge in the present study was also calculated.

Method

Design and Participants

Judges were asked to rate the plausibility and likelihood of transcripts knowing that events varied in the extent to which they were believed to be true. Where intra-class correlations indicated reliability, mean scores for plausibility, likelihood, visual detail and emotion were calculated and used to contrast ratings for believed and not believed events in the future and past. Accuracy and bias on the basis of plausibility and likelihood were also calculated. Ratings were carried out by two female undergraduate research assistants aged 21 and 25 who were in the second year of studies at the same university as transcript senders.

Materials and procedure

Transcripts were prepared and presented on Survey Gizmo software (www.surveygizmo.com) using the same procedure and questionnaire design described in study 1(c) but with additional contextual information and two new questions, so that four ratings were made on each transcript. Testing was carried out in four sessions in the design described in study 1(c). Participants received an email link to each questionnaire in which background information about the study from which the transcripts had been generated was stated. The same form of words was presented before each questionnaire. For clarity, the instruction text presented here shows the text amended for past or future questionnaires in parentheses. The text was:

> *The transcripts you are going to be rating were generated in an earlier study where participants were given a list of 10 everyday events that are typical and frequently experienced by students in their first year at a UK university. Each participant was told to*

choose one event from a list that was something they (had done) (would do) in the (last) (next) two weeks. They also chose another event from the list that was something that they were certain they (had not done) (would not do) in the (last) (next) two weeks.
For each event, the participant closed his or her eyes and travelled (back) (forward) in time to run through what happened. Thus they were either mentally sampling (a real memory) (a real future event) or they were being asked to imagine themselves doing something at a specific place and time in the (last) (next) two weeks. In other words, for some trials, they were imagining a fictitious event, in others they were sampling real (memories) (future event representations).

Next, participants described the simulation out loud. In the present study, you are rating these verbal descriptions of imagined or (remembered) (anticipated) events. Please note that all names and place names have been changed. Otherwise these are literal verbatim (word for word) transcriptions of what each participant said.

To recap, some of the transcripts are events that the participant genuinely (experienced) (intended to carry out). Some are events that they have only imagined – they (did not actually take place) (did not expect to do the activity). In this questionnaire you are not being presented with equal numbers of genuinely (experienced) (anticipated) and imagined events. Therefore you should take care to consider each transcript on its own merits. You would be wrong if you tried to assume that half the events presented are real and half are imagined. Please take care to rate each transcript carefully on each of four dimensions, presented as four questions.

Introductory text in each questionnaire was based on similar text in study 1(c), with an additional reminder that each transcript varied by belief in occurrence. Text in parentheses varied by temporal orientation of the transcripts. The instructions stated:

> *Some of these transcripts represent genuinely (experienced) (anticipated) autobiographical events. Others do not. The order of presentation has been randomised and you are not viewing equal numbers of (experienced) (anticipated) and (not experienced) (not anticipated) events. You are being asked to rate each transcript independently on four dimensions.*

The likelihood question was phrased:

> *How likely do you think it is that the person speaking actually (experienced) (will experience) this event, as described, at that time and place?*

The rating was made on a Likert scale, with the text:

> *How likely is it that the event (occurred) (would occur)? 1,* (*definitely did not happen*) (*definitely would not happen); 10, (definitely did happen*) (*definitely would happen)*

The plausibility question was phrased:

> *Does the overall narrative sound plausible to you? What is the possibility that this story is something that really happened? Could it have happened, as described, in that specific moment in time and place?*

The rating was made on a Likert scale, with the text:

> *How plausible is the event? 1,* (*not at all plausible*)*; 10* (*highly plausible*)

The visual detail question was worded:

> *To what extent does the speaker mention details that allow you to picture the scene?*

The rating was made on a Likert scale with the text:

The participant's description of this event involves visual detail: 1, (little or none); 10, (highly detailed)

The question on emotion was framed with the text:

To what extent does emotion play a part in this transcript? Do you think that the speaker was feeling strong emotions during this event? The emotions could be positive or negative, you are only being asked to rate the emotional intensity experienced by the speaker at the event in his or her recent past.

The rating was made on a Likert scale with the text:

Within the description of this event, the participant's feelings were: 1, (not intense); 10, (highly intense)

3.10 Results

Inter-rater reliability

Intra-class correlation showed poor agreement between the two judges on what constituted plausibility in both temporal directions but this was particularly low when events were set in the future. Emotion and likelihood ratings showed moderate agreement for past but not future events. When rating the level of visual detail in transcripts, judges showed an acceptable level of agreement in both temporal directions.

Table 3.6

Study 1(d) Intra-class Correlations

Measure	*ICC*		
	Overall	*Past*	*Future*
Visual	.77	.79	.76
Emotion	.56	.68	.51
Likelihood	.55	.66	.52
Plausibility	.32	.48	.06

Since reliability for the visual detail scale was acceptable, the mean score of the two judges' ratings was used to examine visual detail. Independent samples t-tests showed that when rating events set in the past, transcripts describing believed events (M = 4.48, SD = 1.77) were seen as richer in references to visual detail than transcripts describing fictitious events (M = 3.87, SD = 1.74), $t(124) = 1.98$, $p = .05$. This pattern did not hold for future events, visual details were similar between believed (M = 3.97, SD = 1.65) and fictitious transcripts (M = 3.78, SD = 1.72), $t(124) = .64$, $p = .53$.

Reliability of judges' ratings for emotions and likelihood showed agreement bordering acceptable levels for past but not future events. On this basis, judges' ratings for emotion and likelihood were examined for past events only. An independent samples t-test showed that believed events set in the past (M = 6.92, SD = 1.82) were seen as more likely to have occurred than fictitious events (M = 5.87, SD = 2.01), $t(124) = 3.09$, $p = .002$. Emotional content was similar in past believed (M = 3.86, SD = .21) and fictitious events (M = 3.53, SD = 1.50), $t(124) = 1.79$, $p = .08$.

Bias and accuracy

To explore the extent to which judges showed a bias to rate all events as likely or plausible, ratings were recoded to create dichotomous variables. Items rated 1-5 for likelihood were recoded as *unlikely*, items rated 6-10 were recoded as *likely*. Items rated 1-5 for plausibility were recoded as *not plausible*, items rated 6-10 were recoded as *plausible*. When believed and fictitious events were compared, judges showed a bias for likelihood and plausibility in both temporal directions that exceeded levels in study 1(c). Table 3.7 displays the overall positive bias (in %) and accuracy with which ratings discriminated believed (*real*) and fictitious (*imagined*) past and future transcripts.

Table 3.7.

Study 1(d) Bias and Accuracy for Plausibility and Likelihood of Events

	Judge	***Past***			***Future***		
		%			*%*		
Measure		*Bias*	*Accuracy*		*Bias*	*Accuracy*	
			Believed	Fictitious		Believed	Fictitious
Likelihood	J3	67	76	41	90	90	11
	J4	72	81	37	61	62	40
Plausibility	J3	98	95	0	100	100	0
	J4	87	90	17	83	83	16

Note: *Real* shows the % of Study 1(b) *believed* transcripts rated > 5 for likelihood, *Imagined* shows the % of Study 1(b) *not-believed* transcripts rated ≤ 5 for likelihood

Both raters showed a more striking positive bias for plausibility compared to likelihood. Judge 3 saw all future events as highly likely and the positive bias for plausibility was almost at ceiling level for both past and future transcripts. Judge 4 showed less bias but this was more pronounced when rating past compared to future transcripts. Results suggest that when raters were aware that events varied on the basis of belief in occurrence, this enhanced the bias to see all events as likely and plausible.

Correlations

Correlations between the rating measures are shown in Table 3.8. Likelihood estimates correlated with plausibility, visual and emotion measures for both judges in all events. Visual and emotion ratings were correlated for both judges in all events. Judge 4's plausibility ratings correlated with other measures, in Judge 3 they did not. This pattern of results could be the product of the two judges using different criteria to assess plausibility, although this is speculation and cannot be ruled in or out on the basis of these data.

Table 3.8

Study 1(d) Judges 3 & 4 Correlations between Measures

	Past events					
	Judge 3			*Judge 4*		
	Plausibility	Visual	Emotions	Plausibility	Visual	Emotions
Likelihood	.450**	.594**	.526**	.594**	.613**	.608**
Plausibility	-	.146	.142		.259**	.360**
Visual		-	.687**			.599**
	Future events					
	Judge 3			*Judge 4*		
	Plausibility	Visual	Emotions	Plausibility	Visual	Emotions
Likelihood	.320**	.233**	.321**	.672**	.502**	.621**
Plausibility		.179*	.021		.269**	.395**
Visual			.560**			.691**

**$p < 0.01$ (2-tailed) *$p < .05$ (2-tailed)

Discussion

Study 1(c, d) compared judges' evaluations of believed and fictitious events generated in study 1(b). Transcripts contained verbal descriptions of believed and fictitious events. Fictitious events were not lies but were merely imagined scenarios set at a specific spatio-temporal location in the recent past or future. Results showed that when raters were not aware that events varied on the basis of belief in occurrence – as was the case in study 1(c) – ratings for plausibility or likelihood did not form reliable scales. Study 1(d) showed that when raters knew that some events were real and others imagined, ratings for visual detail compared to plausibility, likelihood or emotional content were the most reliable. Visual detail was rated as richer in transcripts that described real past events but not richer in transcripts that described truly anticipated events set in the future. Likelihood and emotion ratings were at the low end of acceptable reliability for past events and were not reliable for future events. Analyses on past events showed that transcripts describing real past events were seen as more likely to have occurred but were not seen as more emotional than fictitious past transcripts.

While these results seem to suggest that visual detail indexed variation in the extent to which transcripts described believed events, other analyses showed that judges had a bias to judge all events as likely (and plausible). Table 3.9 shows how contextual information about the origin of the transcripts being evaluated (t*emporal*, *temporal* + *belief*) influenced the bias for all judges to rate past and future events as likely.

Table 3.9.

Studies 1(c, d): Proportion of Events Discriminated By Likelihood Ratings

	Judge	*Believed **		*Fictitious***	
Context		*Past*	*Future*	*Past*	*Future*
Temporal information	1	51	67	35	40
	2	70	57	38	43
Temporal + Belief	3	76	90	41	11
	4	81	62	37	40

Note: * = % of *Believed* transcripts correctly rated > 5 for likelihood ** = % of *Fictitious* transcripts correctly rated ≤ 5 for likelihood

Describing something that happened in the past and intending to do something in the future are epistemologically quite different. In a sense, future intentions are not as objectively "true" as past events. In this study, believed and not believed events were seen as highly similar and judges used the information made available to them to make likelihood judgments. When emotion and visual details were rated alongside likelihood and plausibility, these measures were correlated with each other. Correlations between all four measures could suggest that raters used plausibility, visual detail and plausibility as components when deciding on the likelihood of events. Table 3.9 shows that believed events received high ratings at the cost of discrimination of fictitious events, which also received high ratings, in line with previous literature showing the effect of holding a truth bias.

Chapter 4
Study 2(a, b, c, d, e)
The Future as a Mnemonic

4.1 General Introduction

The constructive episodic simulation hypothesis proposes that episodic future thinking is a constructive process of repurposing traces from episodic memory to generate hypothetical future scenarios (Schacter & Addis, 2007). For example, Szpunar showed that the contents of episodic memory can implicitly prime episodic future thoughts (2010b). Participants were asked to complete scrambled sentence tasks where content was on either a social or academic theme. Later, apparently as another of a series of general ability tasks, participants were asked to generate a future thought. The content of these future thoughts matched the primed theme, indicating that memory (scrambled sentences task) had implicitly shaped the content of future episode thoughts.

This priming relationship appears to be bidirectional. Episodic future thinking has also been shown to operate as an effective encoding tool for memory. In a between-participants design Watanabe (2005) asked one group to imagine carrying out prospective memory tasks at certain times of day. A second group were instructed to learn the plans and times by rote. Those who had used foresight to actively plan carrying out the tasks remembered more of the times and more specific plans. Results here are likely to be related to a well-documented aspect of prospection and memory known as the intention superiority effect. Recall for intended actions is faster and more accurate compared to recall for events that will not be enacted (Goschke & Kuhl, 1993). In the first of several studies documenting intention superiority, participants first learned pairs of short scripts for small actions such as clearing a messy desk. Having learned both scripts, one was highlighted as something that participant would later

be asked to carry out. Participants were told that the other script would be carried out by the experimenter while they watched. When tested for recognition memory, items in the intended scripts were recognised faster and more accurately compared to those related to the not intended scripts. This superiority reverses once actions have been carried out. Recall for events that were intended but are now completed is slower than for never-intended (to be actioned) events (Marsh, Hicks & Bink, 1998; Marsh, Hicks & Bryan, 1999). Taken together, these results suggest that using episodic future thinking to pre-experience a prospective event is likely to increase recall for intended plans, a pattern supported by recent research (Neroni, Gamboz & Brandimonte, 2014).

The evolution of episodic future thinking has been characterised as an adaptive function such that memory enables foresight, which in turn promotes human survival (Klein, Cosmides, Tooby & Chance, 2002; Suddendorf & Corballis, 2007). Testing the idea that memory is primed for evolutionary fitness and should be particularly efficient when information relates to personal survival, a salient scenario (*being stranded in the grasslands of a foreign country*) was found to improve recall on a subsequent memory test (Nairne et al., 2007). Over several studies, a survival scenario has been shown to enhance recall when compared to tasks that lack survival relevance (Nairne & Pandeirada, 2008; Nairne, Pandeirada & Thompson, 2008) and this survival-processing advantage has been extensively extended and replicated with multiple comparison conditions and encoding scenarios (Scofield, Buchanan & Kostic, 2018). The survival effect has been most reliable when tested using free recall or recognition measures but when these methods were compared to an implicit measure (a sentence completion task), there was no advantage of survival processing (Tse & Altarriba, 2010; McBride, Thomas & Zimmerman, 2013). There is evidence that when less elaborate survival scenarios are used for encoding, the memorial advantage is diminished (Kroneisen & Erdfelder, 2011). If the survival processing effect is an

evolutionary adaptation, a reproductive scenario might also be expected to confer a memorial advantage on the basis of evolutionary fitness but across three recent experiments, no evidence was found to support this view (Derringer, Scofield & Kostic, 2017). Taken together, these studies have led some researchers to question whether some other factor lies behind the survival processing effect.

Klein, Robertson & Delton (2010) proposed that the survival processing advantage might be related to the elaborated processing effect of planning rather than the survival element *per se*. Although planning had been included as an experimental condition in previous research (Nairne et al., 2007: 2008; Nairne & Pandeirada 2008;), the precise scenario used differed between conditions. To see if survival processing conferred an advantage when a single scenario was used in all conditions, a between participants experiment was designed in which one theme (being in the woods) was presented in 4 temporal conditions.

Past (*recall a specific episode of camping*)
Future (*plan a future camping trip*)
Atemporal (*use semantic knowledge of camping*)
Survival (*imagine a survival scenario in the woods*)

All participants considered the same list of 30 words in the context of a single camping in the woods scenario followed by a distracter task and free recall of the words that had been rated. Words encoded in the future planning condition were best remembered. There were no differences in recall between the past and atemporal conditions, the survival group showed a non-significant trend to recall more items (p = .07).

In the real world, many people have experience of going camping in the woods but far fewer would have personal experience of a survival scenario or anticipate finding themselves in such a situation in the future. Thus one possible interpretation of this result might be that the survival condition was simply less salient to participants. A second experiment investigated

the planning vs. survival aspects of this paradigm in closer detail (Klein, Robertson & Delton, 2011). Tasks that involved planning (i.e., survival with planning and planning without survival) led to greater recall than tasks that encouraged survival but not planning (i.e., survival without planning). These results suggest that planning is an important component of the survival processing effect.

Planning necessitates engaging in a simulation of the self, which might prompt more elaborate encoding of stimuli. In order to decide if an item is relevant to a plan, a future-oriented appraisal might involve self-referential processing to a greater extent than looking at an item and seeing if a memory pops up (McDonough & Gallo, 2010). In a series of studies, Dewhurst and colleagues used personality words (nouns and adjectives) as stimuli, which were rated with reference to the self, to a scenario about moving house and to a survival scenario of being stranded in grasslands in a foreign country (Dewhurst, Anderson, Grace & Boland, 2017). Results showed that self-reference led to greater free recall and recognition memory compared to the survival or moving house encoding scenarios. On the basis of these results, self-referential processing seems to be a more powerful mnemonic than survival processing. A related question not examined in these studies is the extent to which having existing plans to carry out an activity in the future might confer a greater memorial advantage.

Klein et al. (2010) showed that rating words for relevance to planning a future scenario led to superior retention relative to the same scenario set in the past, in atemporal or survival scenarios. Lifespan camping experience was equivalent across conditions but existing plans to go camping in the future were not asked about, so the extent to which these might have impacted on recall for plan-salient stimuli is not known. Study 2 of this thesis examined a single temporal orientation (future) in the context of which participants rated whether items would form part of their plans in

an imagined future scenario. Each experiment used a between-participants design in which participants were assigned to experimental condition on the basis of whether or not they had a pre-existing intention to carry out the scenario in the near future (2 months). The hypothesis was that having existing plans to carry out a future scenario might engage greater self-referential processing and lead to superior recall of associated words. Two pilot studies were conducted to identify a suitable scenario and associated stimuli and control words.

Overview of the studies

A series of two pilots and three experiments were designed to investigate whether the richer phenomenology and autonoesis associated with intended events in study 1(b) could be replicated by other means, for example, if intention could be shown to act as a mnemonic. In study 1(b), participants were asked to simulate then describe themselves carrying out events for which they had existing plans or that they had recently experienced. Participants repeated the procedure for imagined events set in the recent past and future. Results showed that believed events felt subjectively richer and more detailed compared to fictional events, whether set in the past or future. Thus believed-in future plans were rated as subjectively similar to experienced past events. Chapter 4 of this thesis presents experimental studies in which believed events set in the future at a distance of two months are used as encoding scenarios for learning a list of related words.

A series of two pre-tests and three between-participants experiments were conducted to investigate the impact of intention on recall with groups who either i) intended or ii) did not intend to carry out the encoding scenario. In each experiment, words were processed in the context of a future event that was anticipated or not anticipated within 60 days. In the first instance, two pilot studies were run to identify a suitable scenario on which to base the first experiment and to establish reliability for the associated word list

stimuli. All five studies were reviewed and approved by the Ethics Committee at the Department of Psychology, Royal Holloway, University of London.

4.2 Study 2(a) Cinema Scenario

Introduction

A pilot study was run to identify a suitable scenario for use in study 2(c) and objects associated with this scenario, which would be the experimental stimuli for the recall task. In study 1(b), participants were required to choose 1 truly anticipated and 1 unanticipated future scenario from a list of 10 everyday events that are frequently experienced by university students. Participants imagined carrying out each activity and provided a verbal description of the simulation. In study 2(c), the experimental design required identification of a single scenario that would reliably yield two levels of intention. The event needed to be something that was anticipated or not anticipated to take place in the near future by approximately equal numbers of participants in a random sample of college students at that time of year (November).

The aim of the first pre-test was to identify a suitable scenario and also to find associated stimuli. When thinking about objects encountered in daily life, people organise items into categories that are seen to belong together, for example *fruit* or *tools*. Some categories are stable and enduring but people can also form ad hoc categories that are shaped by the drive to carry out a goal, such as *things to take on a camping trip* (Barsalou, 1983). The pilot study sought to identify a scenario that was a distinctive discrete future episode in which a range of objects could be presented for consideration. The salience of category membership for the experimental word items needed to be clearly differentiated when thought about in the context of this single event scenario.

The frequency with which events had been selected for use as cues in the future conditions in study 1(b) was examined to identify events that had been chosen with similar frequency as both a believed and not-believed event. Event frequency data from study 1(b) are presented in Table 4.1. The event most frequently chosen for both categories was *a trip to the*

cinema, which was chosen as a cue in nine future, believed trials and in seven future, not-believed trials. On this basis, a future cinema trip was selected for pre testing as the experimental scenario in study 2(c).

Table 4.1

Believed and Not-believed Event Selection in Future Trials in Study 1(b)

Event	*Count*	*Event*	*Count*
Pub	10	Gym	15
Club	9	Dinner	8
Cinema	9	Cinema	7
Pizza & movie	8	Try new recipe	6
Coffee	7	Friend's house	6
Progress meeting	7	Progress meeting	6
Gym	6	Club	5
Try new recipe	3	Coffee	5
Dinner	2	Pizza & movie	4
Go to a friend's house	2	Pub	1

Method

Design and Participants. An online questionnaire was used to obtain ratings for 30 items on the basis of cinema scenario-relatedness. Participants were an opportunity sample of 17 staff and postgraduates (8 males) at Royal Holloway, University of London who responded to an email request. The age range was 18-54 (M = 24.1, SD = 6.76).

Materials and Procedure. A list of 15 words representing portable physical objects was taken from the control word list used in previous research (Klein et al., 2010). One item (*couch*) was reworded to *sofa*. Another item (*drapes*) might be associated with a trip to a cinema and was replaced with *towel*, taken from McDonough & Gallo (2009). Thus 15 words were selected on the basis that they were portable objects not obviously associated with a trip to the cinema. A further 15 objects thought

likely to be encountered on a cinema trip were suggested by Royal Holloway Department of Psychology Eyewitness Laboratory Group members. The first pilot study was carried out to obtain ratings for salience to a cinema scenario for these 30 words.

An online questionnaire was created on Survey Gizmo software (www.surveygizmo.com). The first questions collected demographic information and asked participants to rate the frequency with which they visited the cinema *per annum* (*less than once*, *1-5*, *6-10*, *11-15*, *more than 15 trips*). The body of the survey consisted of two parts. In Phase 1, participants were asked to imagine planning to visit a cinema in the near future and to suggest physical objects that might be seen or used on a cinema trip. Instructions were given to type the first 5-10 items that came to mind. This question was included to obtain potential substitute cinema words, which could be validated in a second pilot should the current pilot not yield 15 sufficiently cinema-related words.

Phase 2 of the questionnaire followed the pre-test procedure used by Klein et al. (2010). Ratings for scenario-salience were made on a 5-point scale (1, *very unlikely*; 5, *very likely*). List thresholds were were reported as *M*s >3.8 for experimental words and *Ms* < 2.2 for control words (not associated with spending time in the woods) In Phase 2, 30 portable physical objects (15 cinema-related, 15 control) were presented for rating. Participants were asked to indicate how likely it would be that each item would form part of a future cinema trip scenario on a 5-point scale (1 = *very unlikely*, 5 = *very likely*).

Results and Discussion

Experience. Participants were experienced cinemagoers. When rating the number of cinema visits made per annum: 53% made 1-5 trips, 29% made 6-10 trips. One participant indicated less than one visit a year, one

indicated 11-15 trips per year and one indicated more than 15 trips per year.

New cinema words. Each participant generated examples of objects that they anticipated they might encounter during a cinema visit. A total of 71 suggestions were made, after removing duplicates, 44 items remained. Ten of these were among the cinema words rated in Phase 2 of this pilot study. The remaining 34 items were not portable physical objects. New cinema words are presented in Table 4.2.

Table 4.2

Study 2(a) New, Duplicate or Unsuitable Cinema Item Suggestions

Items	New	Duplicate	Unsuitable	
	Food (3)	Popcorn (8) Drink (5) Ticket (5), Seat (3), Ice cream (2) Curtain, Desk, Screen, Pick 'n' Mix (sweets)	*Not Physical Object*	Queue (3), Movie (2), Bright, Comedy, Credits, Freezing, Horror, Orange Wednesday, Prebook, Theme song, Thriller, Trailers, Surround sound, Walk,
			Not Moveable Object	Taxi (3), Escalator (2), Bus (2), Actor, Complex, Elevator, Friend, Listings board, Odeon, Pizza Hut, Restaurant, Row, Shopping centre, Staines, Station, Ten-pin, Ticket machine, Vue

Note: Numbers in parentheses indicate the frequency of mentions per item

Cinema salience. Mean ratings for salience to the cinema scenario for 15 control words indicated that these objects were seen as unlikely to be part of an imagined future cinema trip (*M*s < 2.2, range 1–2.17). Words anticipated to be associated with a cinema scenario showed more variance (range 2.4–5), with only 9 items validated as *M*s >3.8, in line with scenario-salient stimuli selected by Klein et al. (2010). Words and mean ratings are presented in Table 4.3.

Table 4.3

Study 2(a) Mean Salience for Items to a Cinema Scenario

List	*Cinema*		*Control*	
		M		*M*
	Seat	5.00	Desk	2.17
	Ticket	5.00	Painting	1.53
	Screen	4.88	Sofa	1.53
	Popcorn	4.53	Rug	1.41
	Wallet	4.53	Television	1.33
	Sweets	4.29	Towel	1.24
	Drink	4.18	Microwave	1.24
	Mobile	4.12	Bookcase	1.18
	Poster	3.94	Puppet	1.18
	Projector	3.88	Modem	1.12
	Credit card	3.71	Vacuum	1.12
	Ice cream	3.33	Lawn mower	1.00
	Curtain	3.11	Treadmill	1.00
	3D Glasses	2.94	Dresser	1.00
	NUS card	2.37	Stapler	1.00
	M = 3.99, SD = .78		M = 1.27, SD = .31	

Note: *N* = 17

Discussion. The pilot study was conducted to validate portable physical objects in terms of their association with a cinema scenario. Mean ratings were obtained in line with Klein et al., (2010). Results indicated that 15 items were suitable for use as control words in a cinema scenario (*M* < 2.2, range 1–2.17). None of the new item cinema items suggested in Phase 1 were moveable, physical objects, e.g. film, ticket machine, cup holder and so they were not suitable for further testing. Since there were no new suggestions available for further pre-testing the cinema scenario was rejected for use in the main experiment study 2(c).

4.3 Study 2(b) Flying Scenario

Introduction

A second pilot study was conducted to find a suitable scenario and associated word list for use in study 2(c). Data collection for study 2(c) was planned to be carried out in November, shortly before the end of the semester, which was close to a time when some student participants might be planning to fly overseas. The pilot study was carried out to pre-test an aeroplane flight for use as a possible scenario and to obtain ratings for flight scenario-relatedness of portable physical objects, which would be used as stimuli in the main experiment.

Design and Participants. Study 2(b) was a pilot used to select experimental stimuli for use in study 2(c). A total of 73 students (24 males) at the University of Manchester and the University of Glasgow took part in one of two online questionnaires: Superfly (*N* = 36) and Flight Club (*N* = 37). Participants were recruited through posters, social media and personal contacts and invited to participate via an email link. In both questionnaires, participants indicated their age by selecting a demographic bracket with ranges from 18–24 (*N* = 48), 25–34 (*N* = 9) or 35–54 (*N* = 16).

Materials and Procedure. The study was carried out in two parts. In total, 66 words were rated for salience to a flight scenario (44 flight words, 22 control words).

In Phase 1, a questionnaire (titled *Superfly*) was created using Survey Gizmo software. The design was identical to the online questionnaire used in study 2(a). Control words were 22 non-flying related portable items taken from previous research (Klein et al., 2010; McDonough & Gallo, 2010). Flying words were 22 portable objects likely to be taken on a flight in hand luggage, suggested by Royal Holloway Eyewitness Laboratory

Group members and Department of Psychology postgraduate students at Royal Holloway, University of London.
In Phase 2, a second questionnaire (titled *Flight Club*) was created on Survey Gizmo software and used to pre-test 22 new items suggested by participants in Phase 1.

Phase 1. Participants were sent an email with a link to the online study. The procedure was identical to study 2(a). After answering demographic questions, participants generated examples of flight-related objects. Instructions stated:

> *Take a moment to imagine that you are planning an aeroplane trip in the near future. What items might you want to take in your hand luggage? Imagine that you are packing for your journey. Please write down 5-10 items you will take with you. These are things you are planning to use on the flight.*

Next a randomised list of 44 items was presented for rating. Participants were instructed:

> *You will now see lists of words representing physical objects. We would like you to rate how likely it is that these objects would be part of your future plane trip scenario. For some objects, it may be very likely that you would plan to take them with you, for others it may be very unlikely. It is up to you to decide.*

Words were grouped in blocks of five on each screen with the accompanying text: *Please rate whether you would plan to take each item on the flight.* Ratings were made on a 5-point Likert scale (1= *Very unlikely*, 5 = *Very likely*). Finally participants rated their flying experience by indicating the number of trips they made by plane *per annum* where a return flight = two trips, on a 5-point scale where values were: (*Fewer than 1)*, (*1–2)*, (*3–6)*, (*7–10)*, (*more than 10*).

Phase 2. New items (n = 22) suggested by participants in Phase 1 (Superfly) were entered into a second survey (Flight Club). The design and procedure was identical to the word rating procedure in the first survey (Superfly), including the flight frequency question. Flight-relatedness ratings for the new words were obtained from 37 participants.

Results

Experience. Participants reported a range of flying experience: 88% of participants were distributed equally between 1–2 or 3–6 trips per annum. Five participants flew less than once a year, 4 took 7–10 flights and 2 took more than 10 flights.

Flight salience. Mean ratings for flight-relatedness for 66 words were calculated. Items receiving the highest ratings for salience to a plane scenario (n = 15, $Ms \geq 3.83$) were selected for use as flight-salient stimuli. The 15 items rated least likely to be taken on a plane ($Ms \leq 1.29$) were selected for use as control words. Means for items on both lists are presented in Table X. An independent samples t-test indicated that means for flying-relatedness were higher for experimental words (M = 4.29, SD = .27) compared to control words (M = 1.21, SD = .05), $t(28) = 44.08$, $p \geq .001$.

Discussion. Study 2(b) was used to obtain and validate words for use with a flying scenario. A further pre-test (not reported in this thesis) with 10 participants was carried out using these stimuli. Results indicated that participants with a pre-existing intention to fly remembered more flying words than participants with no existing plans to fly. On this basis, a future flight was selected for use as the main scenario in study 2(c) using 30 rated words generated in study 2(b) as stimuli.

Table 4.4

Study 2(b) Mean Salience for Items in a Flying Scenario

List	Flying			Control	
	Item	*M*		*Item*	*M*
	Passport	4.69		Trashcan	1.12
	Phone	4.56		Plant	1.12
	Ticket	4.57		Vacuum	1.14
	Pen	4.57		Dresser	1.16
	Money	4.53		Painting	1.21
	Earphones	4.51		Microwave	1.22
	MP3 Player	4.28		Stapler	1.22
	Novel	4.28		Television	1.22
	Jacket	4.24		Sofa	1.22
	Magazine	4.13		Lawn mower	1.22
	Jumper	4.11		Candle	1.24
	Camera	4.11		Puppet	1.25
	Water	4.00		Carrot	1.25
	Keys	3.97		Matches	1.28
	Snack	3.83		Desk	1.29
	M = 4.29, *SD* =.27			*M* = 1.21, *SD* = .05	

4.4 Experimental Study 2(c) Flying 1

Introduction

Study 2(c) was designed to extend previous research which showed a temporal advantage to recall of words encoded in the context of a future event (Klein et al., 2010). The aim was to investigate whether holding a veridical intention to carry out a future action would enhance recall of words that were semantically related to that activity. A time boundary of two months was chosen to constrain experimental group membership for theoretical and practical reasons. Temporally close events are more likely to be vivid, accessible and to take the form of concrete plans (D'Argembeau & Van der Linden 2004, 2006; Trope & Liberman, 2010). The encoding scenario needed to be something that participants could confidently predict was or was not going to happen to them. At the time of data collection, two months ahead encompassed a college holiday when it might be expected that a number of students would have plans to travel by plane. Thus a future flight was chosen as the encoding scenario with a two-month future time limit employed to constrain experimental group membership.

Method

Design. A between-group experimental design was used. A group of participants with plans to fly within 2 months was compared to a group of participants who did not intend to fly in the same time frame. The experimental hypothesis was that participants using an intended scenario to learn a word list would exhibit superior recall for scenario-related stimuli compared to participants using for whom the scenario was not one they anticipated carrying out in the next 60 days. Intention to fly was the independent variable with two levels (intention to fly within 2 months, no intention to fly within 2 months). The dependent variable was the number of words recalled. The sample size was calculated to give a power of .80 with an alpha level of $p < .05$ and a medium effect size for an independent-samples t-test. This required a sample of 102.

Participants. Students and staff at Royal Holloway, University of London were recruited via the Department of Psychology's online experiment management system. Additional participants with an intention to fly in the next two months were recruited by announcements made in undergraduate criminology and psychology lectures. In total, 126 participants (28 males) took part in the study. Data were discarded from 10 participants who did not follow experimental instructions, for example recalling anagrams instead of word stimuli during the free recall phase. The difference in age between flyers (M = 22.22, SD = 6.6) and non-flyers (M = 20.30, SD = 3.04) was approaching significance $t(106) = -1.05$, $p = .06$. Two non-flyers aged 45 and 53 were outliers to the predominant age range in this sample (18–37). However there was no change to the pattern of results when these participants were removed or when age was co-varied with the analyses and so results are based on 116 cases (58 flyers, 58 non-flyers, age range 18–53). Participation was in exchange for course credits or payment of £2.

Materials and procedure. The design of study 2(c) was based on a pen and paper experiment carried out in a college lecture (Klein et al., 2010). The present study was presented on ASP.NET software using a Microsoft Access database. This eliminated any possibility that participants could refer back to earlier pages of a booklet during the recall phase. On the basis of the results of study 2(b), *flying on a plane* was selected for use as the encoding scenario. Stimuli were the flying and control words lists generated in study 2(b) (see Table 4.4). A distractor task was created using Excel software to generate 56 anagrams ranging between 4 and 7 letters in length. Anagrams were presented in ascending word length order. The study received approval from the Department of Psychology Ethics Committee at Royal Holloway, University of London.

Groups of up to 10 participants sat at personal computers in a research laboratory at Royal Holloway, University of London. Each workspace had privacy screens on 3 sides. The procedure was based on previous research

(Klein et al., 2010). After entering a unique ID code, participants saw written instructions on the screen stating

> *Please take a few moments to imagine planning a trip by aeroplane in the future*

Orientation to the next screen was decided by choosing one of two statements:

> *If you have existing plans to make a plane trip in the next two months, click here*

> *If you do not have existing plans to make a plane trip in the next two months, click here*

On the next screen, participants with plans to fly were given the instructions:

> *We would like you to travel forward in time and imagine yourself getting ready for the next flight you plan to take in the future. What items do you associate with this scenario?*

> *You will be shown a sequence of words describing physical objects. For each, we would like you to rate how likely it is that you would plan to take this object on board your future flight. For some objects, it may be very likely that you take it with you. For others it may be very unlikely. It is up to you to decide.*

> *You have up to 30 seconds to rate each word. When you are ready, click on 'Continue' to move to the next screen*

Participants with no plans to fly received the same instructions except that the first sentence cued an imaginary (not intended) future scenario:

> *Imagine that you are planning to take a flight in the future.*

All participants were then presented with the word-rating task. Each word appeared on a single page (30s per word). The software randomised the

order of presentation for each participant. The instruction on each page stated:

> *Please rate whether you would plan to take this item on your flight*.

Answers were made on a 5-point Likert scale from 1 (*very unlikely*) to 5 (*very likely*).

After rating 30 words, participants were presented with a distractor task:

> *You now have three minutes to solve some anagrams. Please try to do as many as you can. You might not finish them all.*

A countdown clock was visible. A list of 56 anagrams was shown on one screen in a single column arranged in increasing word length. A response box was presented next to each anagram. Response order was unconstrained so that participants could choose to solve anagrams from anywhere on the list.

After three minutes the task timed out and a new screen presented recall instructions:

> *We would now like you to try to recall the words that you rated in the first part of the study. NOT the anagrams that you solved. Please write the words, one per line, in the spaces provided below, in any order in which they come to mind. You have three minutes.*

After three minutes, experience and anticipation questions were presented over two screens. Annual flying experience was rated on a 5-point scale representing the number of flights taken in the previous year (a return flight = 2 trips). The scale ranged from 1 (*none)*, 2 (*1–2 flights)*, 3 (*3–6 flights)*, 4 (*7–10 flights)*, to 5 (*more than 10 flights)*. Participants were asked to estimate the date of the last flight taken, with a separate response option for those with no flying experience. Three questions centred on future plans. Participants gave the date of their next booked flight and also rated the imminence of any future intentions to fly on a 5-point scale: 1 (*in the next two months*), 2 (*in the next six months*), 3 (*in the next 12 months*), 4 (*no current plans*), 5 (*I am determined not to fly in the future*). Confidence that the plans indicated would

not change was made on a 5-point scale: 1(*very unlikely to change*), 5 (*very likely to change*).

Testing time was 25 minutes. Many participants completed the study in 15–20 minutes since only the distraction and recall phases constrained participants to make use of the full time allocated to each task.

4.5 Results

Experience. An independent samples t-test was performed on the number of flights taken *per annum*. Flyers (M = 3.10, SD = 1.02) were more frequent flyers than non-flyers (M = 1.81, SD = .63), $t(95.29) = -8.20$, $p = .01$. To investigate the recency of past flying experience, the distance in months between the test date and each participant's last flight was calculated, with low numbers indicating proximity to the present: 1 = (*up to 31 days in the past*), 2 = (*1 calendar month–2 calendar months*) etc. (range: 1–79). An independent samples t-test showed that flyers (M = 4.40, SD = .63) took a flight more recently than non-flyers (M = 12.50, SD = 14.32), $t(64.86) = 4.10$, $p < .001$. Flight recency and flying experience were correlated, $r(114) = -.53$, $p < .001$. However there was no correlation between recall for flying words and the amount of time since participants last took a flight, $r(114) = -.04$, $p = .70$. Similarly, there was no correlation between recall for flying words and flying experience, $r(114) = .07$, $p = .44$. Thus these data do not contradict the finding that future planning and past experience engage separate mechanisms when rating/encoding items based on their salience to a scenario (Klein et al., 2010).

Future plans. Confidence that flying plans would not change in the next two months did not differ between flyers (M = 2.14, SD = 1.25) and non-flyers (M = 2.22, SD = 1.33), $t(114) = .36$, $p = .72$. Results from the future intentions scale showed that 78 participants (39 flyers, 39 non-flyers) had a future flight booked. Where participants had a flight booked, the imminence of this event was calculated on the basis of the interval between the testing date and nominated future flight date (range 2 days–10 months). Exploratory analyses were also conducted on the basis of participants' future flying plans. The

impact of having flying plans beyond the two-month boundary could be examined by recoding participants to *flight booked* and *no flight booked* groups. An independent samples t-test indicated that participants with a *flight booked* (up to 10 months ahead) were more confident in their future plans (*M* = 1.99, *SD* = 1.30) than those with *no flight booked* (*M* = 2.58, *SD* = 1.15), *t*(114) = 2.38, *p* = .02. To examine whether having plans to fly within 10 months (without having received the specificity instruction to think about the next flight during encoding) had any impact on recall, a list type (flying words, control words) x condition (flight booked, no flight booked) mixed model ANOVA was conducted on recall. There was no difference to the pattern of results found in the main analysis.

Recall. A word type (flying vs. control) x condition (flying plans, no flying plans) mixed model ANOVA was conducted on recall. There was a main effect of list type so that flying words were better remembered (*M* = 10.30, *SD* = 2.18) compared to non-flying words (*M* = 4.72, *SD* = 1.75), F(1,14) = 564.95, *p* <.001. There was no main effect of having plans to fly on the number of words recalled between flyers (*M* = 15.33, *SD* = 2.95) and non flyers (*M* = 14.71, *SD* = 3.13), F(1, 114) = 1.21, *p* = .27. Thus having the intention to fly had no impact on recall in these data. Figure 4.1 shows recall by word list type.

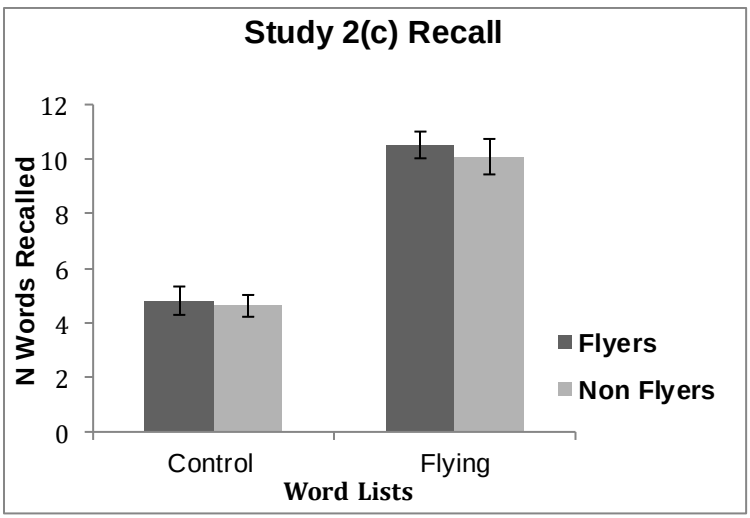

Figure 4.1 Study 2(c) recall by word list type.

Stimuli salience. During the encoding phase of the experiment, word stimuli were rated on the basis of whether each item was relevant to a future flying scenario. Means and standard deviations for the two word lists when rated during the encoding phase are presented in Table 4.5

Since recall did not differ on the basis of intention to fly, the salience of the stimuli during the rating phase was examined in more detail. Mean scores for the flying scenario salience of each word list (flying, control) were calculated for each participant on the basis of ratings made during the encoding phase. A list type (flying salient vs. not flying salient) x condition (flying plans, no flying plans) mixed model ANOVA was conducted on mean salience ratings. There was a main effect of list type with flying words (M = 4.44, SD = .38) receiving higher ratings for flight salience compared to non-flying words (M = 1.13, SD = .20), F(1, 114) = 7313.2, p <.001. There was a main effect of condition (F(1, 114) = 5.23, p = .02. This was qualified with an interaction between list type and condition (F(1,114) = 5.61, p = .02) indicating that word list salience ratings differed between the two intention groups. Post hoc t-tests compared mean salience ratings for the two words lists between flyers and non-flyers. Results lay in the opposite direction to what might have been expected. Participants who had no plans to fly in the near future rated flying words as more salient to a flying scenario (M = 4.53, SD = .32) compared to those participants who planned to fly within the next few months (M = 4.35, SD = .41), t(114) = 2.67, p = .01. There was no difference in flight-salience ratings for control words between flyers (M = 1.14, SD = .22) and non-flyers (M = 1.13, SD = .19), t(114) = -.04, p = .73.

Table 4.5

Study 2(c) Mean Salience for Items in a Flying Scenario

List	*Flying*			*Control*		
		M	*SD*		*M*	*SD*
	Ticket	4.96	.38	Matches	1.40	.79
	Money	4.93	.41	Carrot	1.25	.60
	Passport	4.92	.53	Painting	1.23	.58
	Phone	4.8	.66	Dresser	1.21	.63
	MP3 Player	4.58	.90	Candle	1.19	.53
	Earphones	4.55	.82	Puppet	1.18	.55
	Camera	4.52	.92	Stapler	1.18	.47
	Jacket	4.43	.79	Television	1.16	.55
	Keys	4.37	1.08	Plant	1.08	.35
	Jumper	4.28	.84	Lawn mower	1.06	.30
	Water	4.13	1.15	Trashcan	1.05	.22
	Novel	4.12	1.10	Vacuum	1.02	.13
	Pen	4.09	.96	Sofa	1.01	.09
	Snack	3.97	1.11	Desk	1.01	.09
	Magazine	3.89	1.08	Microwave	1	0
	M = 4.44, *SD* = .38			*M* = 1.13, *SD* = .20		

Discussion

Study 2(c) found no evidence that having the intention to fly led to greater recall of flying related words when encoded using a future scenario. Flying words were preferentially recalled over non-flying words but this did not vary between participants who intended to fly in the next two months and those who did not. Flying experience (either *per annum* or when measured in months from the present moment) was more extensive among flyers but was not correlated with recall, so that on the basis of these data, neither past experience of flying nor having the intention to fly (on a named date) in the near future made flying words more salient.

There was a significant group difference in ratings for the salience of flying but not control words during the encoding phase. Non-flyers rated flying words as more salient to a flying scenario than participants with existing plans to take a flight in the near future. This result was in the opposite direction to the hypothesised relationship between intention and scenario-related word salience. The higher ratings might explain why both groups recalled more flying words at similar levels: any small advantage to the salience of items afforded by having the intention to carry out the activity could have been eclipsed by the higher salience of the flying words to non-flyers, particularly if this came about as a result of some type of more effortful elaboration. A possible explanation is that the encoding task was easier for participants who were pre-experiencing an intended scenario where they were packing for the upcoming flight. Deciding if each item was going in the bag may have been an easier decision in the context of a truly intended future event. By contrast, non-flyers may have had to work harder to generate an imagined scenario in which no such automaticity was available. Non-flyers may have engaged in more effortful thinking about each item, leading to higher salience ratings for flight-related items. Including a measure of task difficulty would make it possible to assess if there were group differences in the automaticity of the task. Other possible explanations for the null results may have been due to methodological issues, which will now be summarised.

First, it was possible that computer presentation of the experiment gave participants less favourable conditions under which to engage in the pre-experiencing future simulation task before beginning the word-rating phase. The original experimental design used by Klein et al. (2010) was conducted as a pen and paper study in a university lecture theatre. Perhaps this less constrained environment enhanced the efficacy of the pre-rating simulation in some unforeseen way. Study 2(c) was presented on a screen and the simulation phase was unconstrained. It may be that the participants were keen to progress at speed and did not fully engage with or follow the simulation instructions.

The salience of flying words may have been affected by recruitment. Participants were asked whether they had plans to fly before they signed up for the experiment, which may have had an extraneous priming effect. Flying words were made salient to both experimental groups. Since this would have been constant across both groups, it might explain why recall for flying words was significantly higher than recall for control words.

A third issue concerns the control words. The flying words were best-remembered by all participants and this may have been because they semantically linked to a narrative about going on a flight, showing evidence of semantic clustering effects (Nairne, Cogdill & Lehan, 2017, experiment 2). Flying words may have benefitted from enhanced relational processing (Burns, Burns & Hwang, 2011), so that *magazine* prompted *snack* and *ticket* led to *passport*. Although control words were physical objects, they did not belong to any obvious schema, ad hoc or otherwise (Black & Bern, 1981). A further study 2(d) was designed to address these issues by using a flying scenario to encode flying words and control words that were related to a camping scenario.

4.5 Experimental Study 2(d) Flying 2

Introduction

Study 2(d) was designed to extend and improve the design of study 2(c), with which it shared the same aim and hypothesis. The aim was to investigate projecting forward in time to a specific event that is believed to be going to happen within two months and using this scenario to encode a list of related words. The hypothesis was that this would enhance recall compared to using a generic (merely imagined) simulation of the same event set in the future. Study 2(d) aimed to address some of the methodological issues that may have led to null results in study 2(c), which will now be outlined.

In study 2(c), the experimental induction and rating/encoding phases were delivered on screen as a computer-based task. Participants read the induction

instructions then clicked through to the rating task. The minimum amount of time to generate the flying scenario and to rate/encode each word for salience to that scenario were not constrained by survey settings. After rating each item, the next word appeared for rating. By repeating the experiment in a group-testing paradigm with participants receiving experimenter-controlled instructions and time constraints, better control of this aspect of the study could be achieved. Study 2(d) more closely followed the between-group design employed by Klein et al. (2010) in which data was collected in a university lecture theatre. Data collection for study 2(d) was carried out in a criminology lecture at Royal Holloway, University of London shortly before the end of the spring semester, when many students might be planning to fly during the holidays.

A second issue related to a lack of parity between control and experimental word lists in terms of cueing effects. In study 2a the control items were less obviously schematically-related compared to the experimental words, which had all been previously rated as salient to a flying scenario. This difference may have led to an advantage for experimental words to be better remembered through relational processing or semantic clustering effects. In study 2(d) the experimental words related to a flying scenario and the control words related to a camping scenario, which extended any advantage of serial recall to both word lists. The camping word list was the experimental word list from Klein et al., (2010). Further, the camping relatedness of control words might be more salient at some times of year than others in terms of future thoughts. Data collection took place in spring so that a future camping trip two months ahead was feasible or at least not implausible. Thus in study 2(d), both camping and flying word lists were related to plausible future activities. Although both lists were encoded in the context of flying and not camping, participants were asked about prior experience and future plans for both flying and camping on the experimental consent form. It was hoped that this would extend any extraneous priming effects of asking about future plans to both scenarios. This also enabled exploratory analyses on the relationship between recall performance and experience or plans for flying and camping.

A final modification to the experimental design was to add a question on task difficulty to the procedure. The question was posed immediately after the rating/encoding task. Previous research using a single scenario to encode words in 4 temporal perspectives found no group differences in task difficulty (Klein et al., 2010). The measure was included since the perceived difficulty of rating words in the context of a scenario that is anticipated to be enacted in the near future vs. merely imagined in the future might be related to between group differences in elaborative encoding and recall.

The experimental hypothesis was unchanged from study 2c. Participants who were intending to fly within two months (and followed instructions to think of the next intended occasion when rating/encoding) were hypothesised to recall more items than those participants with no plans to fly within 2 months and who used a generic-future flying scenario during the rating/encoding phase.

Method

Design

The experiment was a mixed design with *intention to fly within 2 months* as the between groups factor with two levels (*intention to fly in 2 months*, *no intention to fly in 2 months*) and *word list type* the within participants factor (*flying*, *control*). The dependent variable was the number of words recalled from each list.

Participants

81 undergraduate students participating in a criminology lecture close to the end of the semester were asked if they were willing to take part in a study looking at future plans. On the basis of the frequency with which a student population was found to have plans to fly at the end of the previous semester (study 1c), it was anticipated that many students within the group would also have plans to fly in the near future. Data from four participants were discarded: 3 recalled anagrams, 1 received a booklet with missing pages and was not able to follow the procedure. The final sample for analyses comprised

77 participants (22 males) aged 18–37. Flyers (M = 21.33, SD = 2.99) did not differ in age from non flyers (M = 21.68, SD = 2.57), $t(75) = .44$, $p = .66$.

Materials and Procedure

Participants completed a consent form by supplying a unique identity code, giving demographic information and signing consent to take part in the study. The second section of the form asked for the dates of any existing plans to go camping and/or any existing plans to take a plane trip. The flying question was later used to validate experimental group membership, which was self-selected in this design. The camping question was included as a means to hold constant any unintended priming effect of asking about flying before the experiment began by extending this salience to camping as well as flying scenarios.

At the start of the experiment, consent forms were collected in and a 5-page booklet containing the experimental material was handed to participants. An announcement was made that anyone with plans to fly in the next two months should raise his or her hand. Participants who raised their hands were given written instructions that stated:

> *Instructions if you have existing plans to fly before 31 May 2011*
>
> *Take a moment to consider your next flight. Travel forward in time and imagine yourself packing your hand luggage. What items do you associate with this scenario? You will be shown a sequence of words describing physical objects. For each, please rate how likely it is that you would plan to take this object on board your future flight. For some objects, it may be very likely that you take it with you. For others it may be very unlikely. It is up to you to decide.*

Participants who had not raised their hands were handed a sheet of instructions printed on paper, which stated:

> *Instructions if you have no existing plans to fly before 31 May 2011*

Imagine yourself getting ready for a flight in the near future. Imagine you are packing your hand luggage. What items do you associate with this scenario? You will be shown a sequence of words describing physical objects. For each, please rate how likely it is that you would plan to take this object on board your future flight. For some objects, it may be very likely that you take it with you. For others it may be very unlikely. It is up to you to decide.

Time to complete the rating/encoding task was constrained to 3 minutes, in line with study 2(c) and Klein et al. (2010). The experimental stimuli were 14 flying-related words taken from study 2(b, c). The control stimuli were 14 camping-related words from the experimental word list employed by Klein et al. (2010). One item (*water*) had appeared on both source lists and was discarded leaving 28 items to be rated for flying-scenario relatedness. Words were presented in random order, one item per line accompanied by a five-point Likert scale with anchors from 1 (*very unlikely*) to 5 (*very likely*). At then end of the rating/encoding task, instructions stated that participants should wait to be told to turn the page of the booklet.

After 3 minutes participants were told to turn the page to the next question. Written instructions stated:

Please use the scale below to indicate how hard you found the rating task.

The scale ranged from 1 (*very hard*) to 5 (*very easy*). After rating the difficulty of the rating/encoding phase, participants were verbally directed to the next page of the booklet. Here the anagram puzzles used in study 2(c) were presented on the left page, one anagram per line. The right page was blank. Written instructions stated:

You now have 3 minutes to solve some anagrams. Please try to do as many as you can. You might not finish them all.

After 3 minutes had elapsed, participants were told to stop and turn the page with a verbal instruction:

We would now like you to try to recall the words you rated in the first part of the study. Please write the words on the blank page. You may recall the words in any order in which they come to mind. You have 3 minutes.

The final pages of the booklet contained plans and experience questions which were posed for both flying and camping. First participants gave details of their plans by writing in the date(s) of the next occasion when they would i) *fly on a plane*, and ii) *go camping or to any event involving sleeping in a tent*. Confidence that these future plans would not change was indicated on a five-point scale (1 = *very unlikely to change*, 5 = *highly likely to change*). Two questions probed past events. Experience for each scenario was rated on the basis of the number of i) *trips by plane* and ii) *camping trips* taken over the previous 12 months. Ratings were made on scales from 1 (*none)*, 2 (*1–2 trips)*, 3 (*3–6 trips)*, 4 (*7–10 trips)*, to 5 (*more than 10 trips)*. Finally participants were asked to estimate the recency of flying and camping experience by writing in the date of i) *the last flight taken* and ii) *the last camping trip taken*, with separate response options for those with no flying or no camping experience.

4.7 Results

An independent samples t-test on the self-rated difficulty of carrying out the rating/encoding task indicated that there were no group differences between flyers (M = 4.77, SD = .44) and non flyers (M = 4.66, SD = .66), $t(74) = -.61$, $p = .54$. However, the belief that a reasonable distribution of flyers and non flyers might be found when carrying out data collection during a single lecture was not confirmed by these data. Results showed that 18 participants had existing plans to fly within two months. The majority of participants (n = 59) did not have plans to fly within two months. Analyses examining the extent to which participants had past experience and current plans beyond two months are now reported.

Past experience and future plans

The distances between the date of testing and past (recency) or future (plans) for flying and camping were calculated in months (scale: 1 = up to 31 days; 2 = 1 calendar month–2 calendar months). Low numbers on the scale indicate closer proximity to the present. Trip recency (past events) ranged from 1–120 months for flying, and 4–168 months for camping trips. Trip plans (future events) ranged 1–11 months for flying, and 1–5 months for camping trips. Means, standard deviations and results of independent samples t-tests on experimental group differences in past experience and future plans for flying and camping are presented in Table 4.6. Flyers' group membership was somewhat confirmed in that they had flying plans that were more imminent and about which they were more confident compared to non-flyers. Flyers were also more experienced but did not have more recent past experience than non flyers. There were no differences in experience or plans for camping between flyers and non flyers except that flyers were more confident that their existing plans with regard to camping in the future would not change.

Pearson correlations were carried out to investigate if having recent experience or future plans to fly were related to recall for flying words. As an exploratory investigation, the same correlations were conducted on experience and plans for camping and recall of camping words. Pearson correlation matrices are presented in Tables 4.7 and 4.8. None of the measures used to capture past experience or future plans for flying showed any relationship to recall for the experimental word list (flying). Results of the exploratory analyses on camping experience and future plans for camping found no correlations between these measures and recall of items on the control word list (camping).

Table 4.6

Study 2(d) Means and Statistics for Past Experience and Future Plans

	Flyers			*Non Flyers*			*Statistic*	
Variable	*n*	*M*	*(SD)*	*n*	*M*	*(SD)*	*t*	*p*
Experience*								
Fly	18	2.94	(1.16)	59	2.15	(.76)	-2.72	.01
Camp	14	1.71	(.83)	51	1.33	(.59)	-1.62	.12
Recency**								
Fly	18	5.28	(5.29)	57	13.32	(20.09)	1.67	.1
Camp	12	29.17	(34.6)	32	51.50	(34.6)	1.66	.11
Plans**								
Fly	18	1.78	(.73)	37	4.3	(1.89)	7.11	.001
Camp	4	3.50	(.58)	16	3.06	(1.29)	-.65	.52
Confidence								
Fly	17	1.82	(1.29)	59	2.78	(1.49)	2.40	.02
Camp	15	2.80	(1.61)	54	1.83	(1.16)	-2.61	.01

* Scale: *n* trips *per annum;* **Scale: Time in months from the present

Table 4.7

Study 2(d) Correlations for Flying Recall, Experience and Plans

	Plans	Confidence	Experience	Recency
Flying words	-.1	-.03	-.11	.03
Plans		.2	-.36**	.04
Confidence			-.25*	-.05
Experience				-.45**

**p < 0.01 (2-tailed); *p<.05 (2-tailed)

Table 4.8

Study 2(d) Correlations for Camping Recall, Experience and Plans

	Plans	Confidence	Experience	Recency
Camping words	.25	.19	-.10	-.18
Plans		.25	-.19	-.08
Confidence			.45**	-.58*
Experience				-.61**

**p < 0.01 (2-tailed) *p<.05 (2-tailed)

On the basis of the plans and experience information supplied by participants, it was possible to investigate recall on the basis of stated plans for list-related activities (flying, camping). However these results were not derived from the experimental induction that directed participants to think of a specific imminent future event during the rating phase and should be interpreted with caution. To investigate whether having a named flight date in a greater time bound was associated with recall of flying words, participants were recoded to groups on the basis of having plans to fly within 6 months of testing (n = 45) or no plans to fly within 6 months (n = 32). A list type (flying related vs. not flying related) x condition (future flight within 6 months, no future flight within 6 months) mixed model ANOVA was conducted on recall. The pattern of results found when intention was constrained to 2 months still held at a distance of 6 months. There was a main effect of list type showing that flying words were better remembered (M = 10.44, SD = 2.12) compared to non-flying words (M = 5.27, SD = 1.77), F(1,75) = 296.62, p <.001. There was no effect of having plans to take a flight within 6 months on recall (F(1, 75) = 1.62, p = .21) and no interaction (F(1,75) = 1.05, p = .31. Thus, whether or not participants followed the correct induction to match dates of their future flying plans, these data found no impact of having the intention to fly within 6 months on recall.

Word recall

A word list type (flying related vs. not flying related) x condition (flight in 2 months, no flight in 2 months) mixed model ANOVA was conducted on recall (flyers, n = 18; non flyers n = 59). There was a main effect of list type showing that flying words were better remembered (M = 10.44, SD = 2.12) compared to non-flying words (M = 5.27, SD = 1.77), $F(1,75) = 218.22$, p <.001. There was no main effect of using a specific flight within 2 months when rating items in the encoding phase on the number of words recalled by flyers (M = 16.56, SD = 3.29) and non flyers (M = 15.54, SD = 2.9), $F(1, 75) = .88$, p = .35. Thus having the intention to fly within 2 months had no impact on recall in study 2(d). Figure 4.2 shows recall by word list type.

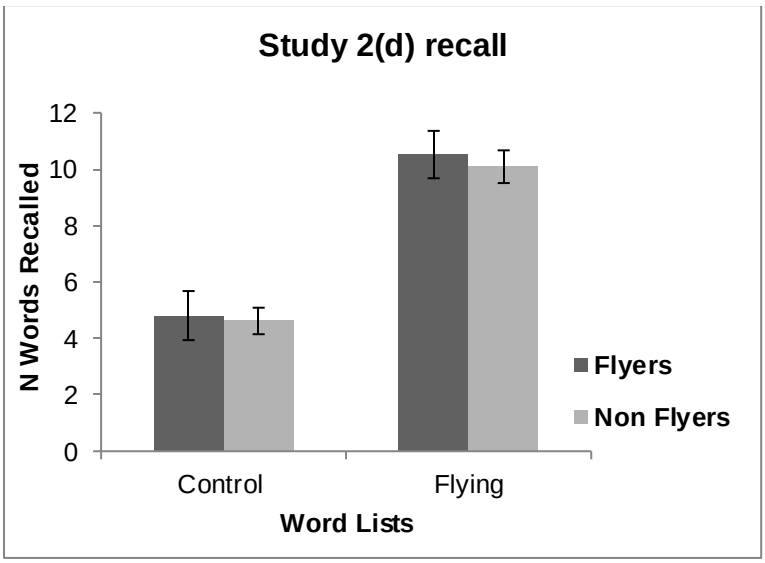

Figure 4.2: Study 2(d) recall by word list type.

Stimuli salience. During the encoding phase of the experiment, word stimuli were rated on the basis of whether each item was relevant to a future flying scenario. Ratings for flying words ranged from 3.71–4.94. Ratings for camping words ranged from 1.05–2.01. Mean ratings for flying and camping word lists are presented in Table 4.9.

Study 2(c) results showed that non flyers compared to flyers rated flying word list stimuli as more salient to a flying scenario. Mean scores for the flying salience of each word list (flying, camping) were calculated for each

participant on the basis of ratings made during the encoding phase of study 2(d). A list type (flying salient vs. not flying salient) x condition (flying plans, no flying plans) mixed model ANOVA was conducted on mean list salience ratings. There was a main effect of list type with flying words (M = 2.43, SD = .49) receiving higher ratings for flying salience compared to camping words (M = 1, SD = 1.32), $F(1, 75) = 874.95$, $p < .001$. There was no main effect of condition and no interaction ($Fs < 1$, $ps > .05$) indicating that word list salience ratings did not differ between flyers and non-flyers.

Table 4.9

Study 2(d) Mean Salience for Items in a Flying Scenario (Experiment 2)

List	*Flying*			*Camping*		
		M	*SD*		*M*	*SD*
	Passport	4.94	0.45	Batteries	2.01	1.23
	Ticket	4.93	0.49	Bug repellent	1.95	1.19
	Phone	4.89	0.64	First-aid kit	1.88	1.06
	Money	4.85	0.55	Grill	1.86	0.46
	Earphones	4.53	1.11	Flashlight	1.43	0.84
	MP3 Player	4.54	1.05	Bread	1.31	0.82
	Camera	4.30	1.04	Binoculars	1.26	0.88
	Snack	4.19	1.05	Garbage bags	1.19	0.66
	Pen	4.14	0.96	Matches	1.16	0.46
	Keys	4.05	1.23	Tent	1.16	0.46
	Novel	3.95	1.17	Bowls	1.09	0.36
	Jacket	3.89	1.35	Rope	1.08	0.49
	Jumper	3.79	1.28	Can opener	1.07	0.47
	Magazine	3.71	1.33	Knife	1.05	0.44
	M = 4.33, *SD* = .49			*M* = 1.32, *SD* = .45		

Note: N = 77

Discussion

Study 2(d) compared recall performance when a specific vs. generic future flight scenario within two months was used to rate/encode flying and camping words for salience to the scenario. Results showed that flying words were

better remembered by both groups. Flyers were more experienced than non-flyers and experimental group membership was confirmed in that flyers were also more likely to have future plans set closer in time. However correlations showed no relationship between measures of past experience or future plans and recall for flying or camping word lists. The experimental word list was validated by receiving higher salience ratings than the camping word list and unlike study 2(c), there were no group differences in these ratings. An independent samples t-test showed that groups did not report any difference in the difficulty of carrying out the rating/encoding task.

The study aimed to refine the design of study 2(c) by using a pen and paper design to improve the control exerted over the induction and rating/encoding phases. Although this control was afforded by the design, the study had very low power. Only 18 participants stated that they had plans to fly before 31 May 2011. The means by which group membership was validated had relied on the assumption that participants would closely follow instructions. When preparing data for analyses, the dates of future flying plans given on the consent form and in the final questions of the experiment were used to assign participants to *flyer* and *non flyer* groups. During data collection, research assistants handed experimental induction instructions to participants who signalled that they had plans to fly before a certain date but no count was performed on how many participants self selected to receive this experimental induction. Thus it is possible that some participants may have been coded as *flyers* but in fact received *non flyer* instructions. Conversely, wording of the *non flyer* instructions was relatively ambiguous and did not eliminate the possibility that participants in this group may have chosen to think forward to the next occasion on which they would be flying during the rating/encoding phase. For example, 7 participants stated the next flight they would take would be on 1 June, one day beyond the cut off date of 31 May 2011.

The design of the study had been modified so that control words related to a single scenario (camping). This extended any advantage of serial recall to both experimental and control word lists however results showed that flying words were still better remembered than camping words. Since participants

had given details of camping plans, it was possible to run exploratory analyses to see if having the intention to go camping had any impact on recall. Participants were recoded into those who had named specific dates to go camping in the future (n = 18) and those who had no plans to go camping (n = 59). Again, the pattern of results did not change from the main results: flying words were better remembered than non-flying words ($F(1,75) = 195.98$, $p < .001$) but there was no effect of camping plans on recall ($F<1$) and no interaction ($F(1,75) = 1.81$, $p = .18$).

One general observation of Studies 2(c, d) that might have affected results was a lack of stringency in the measurement of English language proficiency, which may have varied as an artefact of experimental group selection (flying in a college holiday vs. no plans to fly). All participants indicated on consent forms that they were fluent English language speakers but this measure may have been insufficient to assess the impact of fluency on these data.

A third experiment was designed to extend study 2(d) by replacing flying with the camping scenario and word lists employed by Klein et al. (2010). Any difficulties with using a future flight scenario would be eliminated. Additionally, this scenario and both experimental and control word lists had been validated by previous research. The study was conducted in late spring and early summer, when many people in the UK would be planning a camping trip within two months.

4.8 Experimental Study 2(e) Camping

Method

Design

The experiment was a mixed design with *intention to camp within 2 months* as the between groups factor with two levels (*intention to camp in 2 months*, *no intention to camp in 2 months*) and *word list type* the within participants factor (*camping*, *control*). The dependent variable was the number of words recalled from each list.

Participants

Participants were individuals with an active interest in camping or attending music festivals recruited through web forums and social networking web sites: DontStayIn (dontstayin.com), eFestivals (www.efestivals.co.uk), Facebook (www.facebook.com), Glastonbury Forum (www.glastonburyforum.com), Twitter (www.twitter.com), and UK Campsite (www.ukcampsite.com).

Before exclusions, the full data set consisted of 296 complete responses. Campers (n = 208) had plans to camp at a weekend music festival within 60 days. Non-campers (n = 88) indicated that they no existing plans to go camping but they did have plans to attend a day music festival (with no camping facility) in the next 60 days. Exclusions were made on the basis of failing to follow experimental instructions (*e.g.* choosing an experimental induction that did not match stated camping plans, recalling anagrams instead of words or duplicate entries from the same IP address), missing data on age or missing an identity code (so that data could not be matched to a consent form). Participants in the final analysis were 94 campers (41 males) and 56 non-campers (11 males) aged 18–40 who were undergraduates or educated

to at least Bachelor degree level. Campers (M = 27.63) and non-campers (M = 26.11) did not differ in age, $t(148) = -1.52$, $p = .13$.

Materials and procedure

A consent form was designed on Survey Gizmo software (www.surveygizmo.com). The survey settings limited access to participants with IP addresses located within the United Kingdom. The main experiment was described as a planning study that would take 15–20 minutes to complete. Demographic questions on age, gender, English language fluency and educational attainment were presented. Educational attainment was denoted by choosing the highest qualification held from (*GCSE or O-Levels*), (*A-Levels*), (*Trade & technical qualification*), (*Undergraduate*), (*Bachelor degree*), (*Masters degree*), (*PhD*), (*Law degree*) or (*Medical degree*). Two questions related to future plans: first the date of any plans to go camping in the next six months was entered. This information was used as a baseline from which to check that participants had chosen the appropriate scenario induction (Route A or B). The same question was then repeated for flying plans, which served to inhibit further thoughts of camping by turning attention to a different type of scenario. The consent process ended with a reminder that the main experiment should be carried out in a quiet room with mobile phone switched off and should take place when the participant was certain that they would not be disturbed for 15 minutes. After indicating consent, participants clicked on a link to proceed to the main experiment.

The main experiment was designed on ASP.net software linked to a Microsoft Access Database. After entering the unique ID code to match the consent form, two options were presented on screen. Participants with no plans to go camping within 60 days selected Route A and saw instructions based on the future scenario instructions in the camping study conducted by Klein et al. (2010), adapted for screen presentation:

> *Imagine that you are making plans to take a camping trip in the future. What items would you plan to take with you? You will be shown a sequence of words describing physical objects. I would like you to rate*

how likely it is that you would take each of the objects on the list as you plan your camping trip. For some objects, it may be very likely that you take them. For others, it may be unlikely. It is up to you to decide.

Participants who had existing plans to go camping in the next 60 days selected Route B and were referred to the next camping trip they would be taking with the instructions:

I would like you to travel forward in time and imagine yourself getting ready for the next camping trip that you plan to take in the future. What items would you plan to take with you? You will be shown a sequence of words describing physical objects. I would like you to rate how likely it is that you would take each of the objects on the list as you plan your camping trip. For some objects, it may be very likely that you take them. For others, it may be unlikely. It is up to you to decide.

In the rating/encoding phase 30 words were randomized for each participant and presented for rating one at a time. Stimuli were taken from Klein et al. (2010), with two items changed to UK English (*drapes*, *couch*). Half the words were camping-related: *batteries, binoculars, bowls, bread, bug repellent, can opener, first-aid kit, flashlight, garbage bags, grill, knife, matches, rope, tent, water*. Half the items were objects that might be found in a home: *bookcase, curtains, desk, dresser, lawn mower, microwave, modem, painting, puppet, rug, sofa, stapler, television, treadmill, vacuum*. For each item, the rating was made on a Likert scale from 1 (*very unlikely*) to 5 (*very likely*). A small clock face in the corner of the screen displayed a countdown from 30s. After each rating was made the next item appeared and the timer reset to 30s. Immediately after all 30 words had been rated, task difficulty was indicated on a Likert scale that ranged from 1 (*very hard*) to 5 (*very easy*). The distraction phase was an anagram-solving task (taken from Studies 2c and d). Participants were told to solve as many anagrams they could in 3 minutes. Following the distraction task, participants saw instructions to recall as many items as could be remembered from the word-rating task (*not the anagrams*). Words were typed in, one per line, in any order. The recall phase was

constrained to 3 minutes, which was displayed on the screen in the form of small clock face showing the count down.

The final screens of the study presented planning and experience questions. First participants typed in the date of the next occasion that they planned to go camping (*or to any event involving sleeping in a tent*), with a separate response option for those with no camping plans. Confidence that plans would not change was indicated on a 5-point scale: 1 (*very unlikely to change*), 5 (*very likely to change*). Two questions probed past experience. Participants rated the number of camping trips made each year from 1 (*none)*, 2 (*1–2 trips)*, 3 (*3–6 trips)*, 4 (*7–10 trips)*, to 5 (*more than 10 trips)*. Finally participants were asked to estimate the date of the last time they went camping, with a separate response option for those who had never been camping.

4.9 Results

Participants were assigned to experimental groups on the basis of the experimental induction route that had been taken (Route A or B). Participants' stated plans for camping (next trip date) were used to verify that the experimental induction route chosen by the participant matched camping plans at a distance of 2 months ahead. An independent samples t-test on the self-rated difficulty of carrying out the rating/encoding task indicated that there was no difference on this measure between campers (M = 4.77, SD = .54) and non campers (M = 4.82, SD = .43), $t(148) = .66$, $p = .51$.

Stimuli Salience

Mean ratings for the camping salience of words made during the rating/encoding task indicated that items on the control word list were seen as unlikely to be taken on a camping trip (M = 1.12, SD = .24, range 1–1.99). There was more variance among the experimental words (M = 3.64, SD = .85, range 1.95–4.95). In contrast with previous research (Klein et al., 2010), two items (grill, binoculars) received ratings below the midpoint. Binoculars was rated within the range of the non-camping word list. Means and standard deviations for camping and control word stimuli are presented in Table 4.10.

A list type (camping vs. control) x condition (camping plans in 2 months, no camping plans in 2 months) mixed model ANOVA was conducted on list salience ratings. There was a main effect of list type with camping words (M = 3.64, SD = .63) receiving higher ratings for camping scenario salience compared to control words (M = 1.13, SD = .19),-$F(1, 148) = 3146.48$, p <.001. There was a main effect of condition ($F(1, 148) = 38.07$, p <.001. This was qualified with an interaction between list type and condition ($F(1,148) = 5.62$, p <.001) indicating that word list salience ratings differed between the two intention groups. Post hoc t-tests compared mean salience ratings for the two words lists between campers and non campers. Participants who had no plans to camp in 2 months rated camping words as more salient to a camping scenario (M = 4.02, SD = 1.94) compared to those participants who had plans to camp within months (M = 3.41, SD = .60), $t(135.42) = 6.84$, p <.001, 2-

tailed. There was no difference in camping salience ratings for control words between campers (M = 1.11, SD = .15) and non campers (M = 1.15, SD = .23), $t(148) = 1.42$, $p = .16$.

Table 4.10

Study 2(e) Mean Salience for Items to a Camping Scenario

List	*Camping*			*Control*		
		M	*SD*		*M*	*SD*
	Tent	4.95	0.36	Rug	1.99	1.39
	Flashlight	4.81	0.57	Puppet	1.17	0.65
	Water	4.34	1.21	Painting	1.13	0.55
	Garbage bags	4.22	1.05	Modem	1.11	0.54
	Batteries	4.11	1.08	Curtains	1.10	0.58
	First-aid kit	4.00	1.09	Dresser	1.07	0.42
	Knife	3.98	1.32	Sofa	1.07	0.30
	Matches	3.71	1.38	Television	1.06	0.26
	Bread	3.51	1.4	Microwave	1.05	0.33
	Can opener	3.39	1.55	Desk	1.03	0.2
	Bug repellent	3.33	1.33	Stapler	1.03	0.16
	Bowls	3.13	1.51	Treadmill	1.03	0.24
	Rope	2.64	1.25	Vacuum	1.03	0.27
	Grill	2.50	1.45	Bookcase	1.01	0.08
	Binoculars	1.93	1.17	Lawn mower	1	0
	M = 3.64, SD = .85			M = 1.12, SD = .24		

Note: N = 150

Recall

A word type (camping vs. control) x condition (camping plans within 2 months, no camping plans within 2 months) mixed model ANOVA was conducted on recall. There was a main effect of list type showing that camping words were better remembered (M = 7.29, SD = 1.83) compared to control words (M = 4.92, SD = 1.71), F(1,148) = 141.96, p <.001. There was no main effect of having plans to camp in 2 months on the number of words recalled between campers (M = 11.99, SD = 2.58) and non campers (M = 12.46, SD = 2.88), F(1, 148) = 1.98, p = .16 and no interaction (F<1, p = .84). Thus having the

intention to camp in 2 months had no impact on recall on the basis of these data. Figure 4.3 shows recall by word list type.

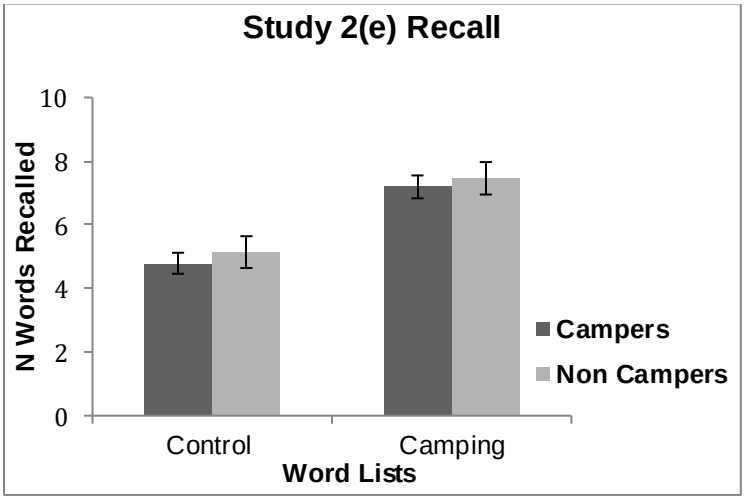

Figure 4.3: Study 2(e) recall by word list type.

Camping Experience and Future Plans

Past experience was indexed by the annual frequency of experience and recency on the basis of the date that participants went camping. Future orientation to camping was indexed by the imminence of the next planned trip and confidence that plans would not change. The temporal distance of past experience (recency) and future (plans) for camping were calculated on the basis of the interval between the dates nominated by participants in each temporal direction and the date of testing (scale: 1 = up to 31 days; 2 = 1 calendar month–2 calendar months; Ranges: past 1–133; future 1–5 months). Means, standard deviations and results of independent samples t-tests on group differences on variables of past experience and future plans for camping are presented in Table 4.11.

Campers were more experienced and had been on a camping trip more recently compared to non campers. Only 4 non campers had future plans to camp (all more than 2 months ahead). Campers' future plans validated group membership in that they were more imminent and campers were also more confident that these plans would not change. Thus campers and non campers clearly differed in the extent to which a future camping scenario (at any distance) was believed to be going to occur.

In order to investigate whether past experience or future plans to camp were related to recall for camping words, Pearson product moment correlations were run on these variables. Results showed that participants who went on more camping trips *per annum* had been camping more recently and were more confident that future camping plans would not change. None of the experience or plans variables were correlated with recall. A Pearson correlation matrix is presented in Table 4.12.

Table 4.11

Study 2(e) Means and Statistics for Past Experience and Future Plans

Variable	*Campers*			*Non Campers*			*Statistic*	
	n	*M*	*(SD)*	*n*	*M*	*(SD)*	*t*	*p*
Experience*	94	2.32	(.69)	56	1.32	(.47)	-9.55	.001
Recency**	92	10.42	(7.59)	40	38.65	(38.83)	4.56	.001
Plans**	94	1.36	(.80)	4	3.00	(.82)	4.0	.001
Confidence	94	1.4	(.9)	56	2.48	(1.19)	5.86	.001

* Scale: *n* trips *per annum;* **Scale: Time in months from the present

Table 4.12

Study 2(e) Correlations Between Camping Recall, Experience and Plans

	Plans	Confidence	Experience	Recency
Camping words	.1	.15	-.06	-.09
Plans		.40*	-.02	-.04
Confidence			.30*	.15
Experience				-.52*

*p < .01 (2-tailed)

Discussion

Two items on the camping words list were rated below the midpoint yet camping words were preferentially recalled by all participants, regardless of this lack of clear discrimination between experimental and control stimuli. Independent samples t-tests on past experience and future plans for camping

revealed group differences on all four of these variables, showing that campers were both more experienced and also more likely to be holding current plans to go camping. Analyses of stimuli salience showed that camping words (but not control words) were seen as more camping related by non campers compared to campers.

In addition to the lack of evidence for the experimental hypothesis, the results of study 2(e) also suggest that neither past experience nor future intention facilitated recall of camping words. Within this context, it is difficult to interpret how non campers rated experimental stimuli as stronger exemplars of camping-related items but there were no group differences in recall or self-rated task difficulty. A recent review paper highlighted evidence from eight studies showing that semantic knowledge is sometimes employed to embellish episodically impoverished events (Devitt, Addis, Schacter, 2017). A related and tentative explanation for these results is that participants with no intention to go camping used semantic framing or contextualisation during the encoding task, which led to an encoding enhancement so that group differences in recall for scenario-related words were eliminated. Were this paradigm to be replicated, it would be interesting to examine the episodic and semantic contributions to the encoding scenario in more detail, perhaps by having participants write a description of the encoding scenario at the end of the task, which could be coded for episodic and semantic content. These comments notwithstanding, the third in this series of experiments replicated the finding that having the intention to carry out a specific activity in the future did not lead to a significant improvement in recall of a semantically related word list.

4.10 General Discussion Mnemonic Studies

Previous research investigating the memorial advantage of survival processing showed that using a future planning scenario led to greater recall for a list of scenario-related portable physical objects compared to the same scenario used to encode items in past, atemporal or survival contexts (Klein et al., 2010). The scenario employed by Klein had been *camping in the woods*. A series of two pre-tests and three experiments were conducted to extend this advantage of future planning. The aim was to see whether having the intention to carry out an event and using that specific instance in the future to encode a list of portable physical objects could be shown to enhance recall for scenario related items. To choose a suitable scenario for encoding, results of study 1(b) were examined and a cinema scenario was identified as an event chosen with equal frequency as something intended and not intended to be carried out in the near future. Thus a cinema scenario was selected for use as a jumping off point for study 2. Pilot study 2(a) did not yield reliable experimental stimuli that were portable objects salient to a cinema scenario. Pilot study 2(b) was carried out to find stimuli suitable for an alternative scenario based on flying. This scenario, set at a distance of two months in the future, was used as the encoding scenario in study 2(c). Results showed that there was no difference between flyers and non-flyers in recall for scenario-related stimuli, although flying words were better remembered by all participants, leading to the hypothesis that control words should also be schematically linked.

Results of study 2(c) also showed that individuals who did not intend to fly in the near future rated flying words as more strongly associated with an imagined flight scenario compared to the experimental group, who rated the words in the context of a real flight anticipated on a named date in the near future but saw flying words as *less* salient to the scenario. This may have been an artefact of comparatively more effortful processing when a future scenario is imagined rather than intended. It could be that flyers were able to make faster or easier decisions on whether or not each item would be taken on board in hand luggage. If an item was not seen as something that would

be taken on the flight, it may have received a rating that was downgraded in line with personal intention, even though the item was still rated as more flight-related than control word items by both groups. It is possible that the more elaborated task of imagining a not-intended future event and then making judgements on which items were more or less relevant to that scenario led to deeper processing, cancelling out any benefit of self-reference in the experimental group during the encoding task. There was no difference in recall between flyers and non-flyers in study 2(c) and a second study was designed to bring the method closer to the study run by Klein et al., (2010).

In study 2(d) a future flight was re-employed as the encoding scenario. Experimental words were related to a flying scenario. Control words were semantically related to a camping scenario. Since both lists related to different themes, this was anticipated to make both word lists more amenable to serial recall effects. The method was based more closely on Klein et al. (2010) in that data collection took place in a lecture theatre using pen and paper as opposed to computer based presentation and a question on task difficulty was posed in order to see if there were group difference in the perceived effort of encoding. Results showed that fewer flyers than had been anticipated were found in the sample so the study lacked power. There were no group differences in ratings of scenario-salience for either word list or for difficulty in carrying out the rating/encoding task. Experience and plans measures for flying and camping were used to run exploratory analyses. Results did not indicate that past experience or future plans facilitated recall. Flying-related words were preferentially recalled by all participants compared to control (camping) words.

Both flying studies drew on populations where there may have been intention group differences in English language fluency. In order to eliminate this potential confound and test the hypothesis with more power, a third study in the series was designed. In study 2(e) camping replaced flying as the encoding scenario. The same pattern of results was found. Participants remembered camping words whether they had encoded the list in the context of a real (planned) or imagined future camping trip. Stimuli salience ratings

differed between groups. Participants who had no plans to camp rated the camping stimuli as more camping-related than the experimental group. Results from two of three experimental studies seem to indicate that not having the intention to carry out the action in the future led to higher salience ratings for experimental words. Plans and experience differentiated the groups: the experimental group held more imminent camping plans and were also more experienced campers.

All participants preferentially recalled experimental word lists, whether these were flying related (study 2c, d) or camping related (study 2e). In all three experimental studies, scenario-related words were preferentially recalled whether or not they were encoded in the context of an intended future scenario and whether or not raters held a high degree of past experience and/or current plans for such scenarios. In two of the studies, participants rated scenario words as more salient to the scenario if they did not hold an intention to carry out that activity within two months. Had study 2(d) not lacked power, results may also have followed the same pattern. Although plans and experience did not appear to enhance recall, future research using this paradigm would do well to better control these variables. The results of these studies do not eliminate the possibility that the (less experienced) group with no specific future plans rated word salience in a manner that facilitated encoding and led to a memorial advantage at recall, in the opposite direction to the hypothesis, eliminating group differences.

It is worth pointing out that the camping word list preferentially recalled in study 2(e) had been previously employed as the control word list in study 2(d), where fewer camping than flying words were recalled. This suggests that scenario-relatedness is what led to preferential recall, irrespective of specificity instructions (intended, not intended) and irrespective of word list. Specifically, mere relatedness to a single scenario did not lead to a memorial advantage (study 2d control words). It was the relatedness of the word list to the encoding scenario that led to preferential recall in all three experimental studies.

The procedure by which participants accessed representations of specific events in the past and future in study 1(b) was more immersive than the procedure employed in study 2 experiments. For example, study 1(b) participants were tested individually, and were read extensive instructions that carefully qualified definitions of episodic prospection and memory. The simulation phase for each event was conducted with closed eyes and while wearing headphones to reduce intrusions and enhance engagement with the subjective experience of mental time travel. The simulation instructions in the studies reported in this chapter were considerably briefer and were far less detailed across the three studies, whether presented on screen in the laboratory or within a booklet handed out in a lecture theatre. It is possible that this less immersive induction may have led to less engagement with the anticipated scenario in participants with existing plans. An alternative hypothesis is that temporal distance was a factor. It could be that imagining an anticipated event two months in the future is too temporally distant to make specific relatedness to the encoding scenario salient to those with matching plans. Alternatively, participants with no pre-existing plans may have found that consideration of the word list caused them to devote more thought to planning, enhancing the elaboration during encoding and reducing any group differences. All of these hypothetical explanations for null results signpost a clear methodological limitation to this series of studies, which was the absence of a control condition. While any or all of these factors may help explain the lack of expected findings, it is not possible to draw definitive conclusions on these points since there was no past or atemporal comparison group. In addition, an emerging literature has suggested an interesting new direction for this research.

Despite careful attention to the design, the series of experiments reported in this chapter may well have lacked power. The original research published by Klein and colleagues (2010) reported the finding that the future condition facilitated recall in comparison to past, survival and atemporal encoding conditions with a small to medium effect size ($d = .43$). A power analysis reported by other researchers who have also not replicated the Klein findings showed that 85 participants per condition would be needed to replicate this

effect (Dewhurst, Anderson, Grace and Howe, 2019, p.27). Not only does this suggest that all three experiments in study 2 lacked power but it further highlights the importance of including a control condition in the design of the study. Without a control condition to contrast with the future-oriented, salient and not-salient conditions, it was not possible to replicate the findings of Klein et al. (2010). Nor was it possible to eliminate the possibility that the memorial advantage of future thinking was at ceiling already (if it even exists).

These results do not support the idea that salience is guiding retrieval however they do potentially feed into an emerging literature with two important features. Firstly, the facilitative effect of scenario-related stimuli in a future encoding condition vs. past, atemporal and survival has not been replicated in six studies that used a very similar design (Dewhurst, Anderson, Grace & van Esch, 2016; Dewhurst et al., 2019). This might suggest that any facilitation of salience to correct recall during future thinking would be highly elusive, if it exists at all. Secondly, the primary finding of these studies was that using future thinking (with or without a planning induction) to encode a scenario-related word list led to more false memories in comparison with past and control encoding conditions (Dewhurst et al., 2016; 2019). This effect was elicited using the Deese/Roediger-McDermott (DRM) method (Deese, 1959; Roediger & McDermott, 1995) and was extended and replicated using the scenario-relatedness rating procedure (Klein et al., 2010). Results showed significantly more false memories in the future compared to past or control encoding conditions, whether tested by recognition memory or free recall.

As discussed in the introduction, one adaptive function of mental time travel that has been suggested is the ability to draw on memory to engage in effective planning (Klein, Cosmides, Tooby & Chance, 2002; Klein, Robertson & Delton, 2011). There is also evidence that when future thinking is used for planning rather than simulation, it is more effective than thinking about the past for eliciting detailed plans (Cordonnier, Barnier & Sutton, 2016). Susceptibility to the generation of false memories in future contexts in response to critical lures has been explained to be a mechanism of associative activation (see Otgaar, Howe, Muris & Merckelbach, 2019 for a

recent summary). This association between future thinking and false memories provides evidence that more associative and creative processes are engaged when considering the future compared to the past (Dewhurst et al., 2016) and this may have adaptive benefits (Schacter, Guerin & St Jacques, 2011). Were the research in this chapter to be extended, it could be hypothesised that a veridical intention to carry out the activity used to encode the word list might enhance the vividness of the scene and lead to more associative thinking, with veridical plans enhancing susceptibility to lures. Alternatively, participants with no plans might be shown to be more susceptible to lures, since the generation of an entirely novel (not anticipated) scene might promote more associative processing than sampling an already-anticipated scene. To extend the research presented in this chapter, it would be interesting to examine both false memory and accurate recall in future (intended), future (not intended), past and atemporal conditions. If correct recall did not differ between participants with and without plans, this would confirm the null hypothesis that there is no facilitative effect of personal salience, in line with the pattern of results suggested by studies 2(c, d, e). This design would also permit an attempt to replicate the findings of Klein et al. (2010), who showed that thinking about events in the future led to better recall compared to survival, past and atemporal conditions, although this was not replicated in other more recent research (Dewhurst et al., 2016; 2019).

Returning to broader themes of the research in this thesis, one aim is to examine the evidence that truly intended plans have a corollary in observable behaviour. This could open avenues through which intended vs. not intended behaviour might be reliably detected by third parties. This is an active area of interest in psycho-legal research despite the lack of theoretical or evidential support from the wider field of cognitive psychology. Further consideration of what the null findings of study 2 add to this picture forms part of the Overall Discussion of the thesis presented in Chapter 8.

Chapter 5 – Experimental – Fast Forward (Study 3)

5.1 General Introduction

In study 1(b) events anticipated to take place in the next two weeks received higher ratings for autonoetic consciousness and sensory detail compared to events for which there was no pre-existing intention to carry out the activity. In Study 3, this apparent salience conferred by intention was contrasted at a greater temporal distance by investigating salient goals and current plans at a distance of two weeks and one year into the future. Within the remit of this thesis, intention in future thinking is examined. In doing so, evidence from areas of psychology that do not typically speak to each other is presented. An example of this comes in the form of recent forensic research in which goals have been suggested to provide a framework that might be used to distinguish statements that are based on true and false intent (Mac Giolla, Granhag & Ask, 2017).

It has been suggested that elucidating the processes of goal pursuit might yield markers that could distinguish true from fictitious accounts of future activities (Mac Giolla, Granhag & Ask, 2017). Goals are defined as *desired end states*. Intentions in this model are defined as *active goals that one is committed to carrying out*. The proposed model posits that intention is a process by which latent goals become activated as a result of reasoning and commitment. The goal activation process is described as a multidirectional interplay between episodic future thoughts, spontaneous thoughts, planning, attention, memory and evaluative judgements. The suggestion is that truly-intended activities differ from not-intended activities by the absence of active goal-related processing. The authors note that more research is needed to determine the extent to which intention can be directly mapped to having an active goal and that this is particularly problematic when studying the intention to deceive.

A true intention to carry out an activity might be thought of as an active goal. It is not clear how a not-intended scenario employed to deflect attention from true intention would fit the proposed architecture. If a deceiver is suitably motivated, he or she holds an active goal that the cover story must be believed. The authors have called for research comparing holding a true intention, a false intention and having no intention at all. The present study described in this chapter goes some way to answering this call by examining goal-related prospection for events that have been selected by participants on the basis that these scenarios vary on the basis of personal belief in future occurrence, whether are set in the near and distant future.

Previous research outside of the psycho-legal context has examined the interplay of goals, planning, and episodic mental time travel and suggests that the phenomenological richness of prospection is related to distance from the present. According to construal theory, attributions about distant future behaviour (one year ahead) are based on relatively more abstract information but are made with more certainty compared to near future plans, which are anticipated to be more vulnerable to situational variance that will impact on performance (Nussbaum, Liberman, Trope, 2006). Typical events are seen as more likely to occur and atypical events less likely to occur at a distance of one year ahead (Henderson, Fujita, Trope & Liberman, 2006). As noted by Liberman, Trope, & Stephan (2007) this effect of distance is even demonstrated in some of the words people use to describe likely and unlikely events, for example, an unlikely event is sometimes referred to as a “remote possibility” and a likely event can be called a “near certainty”. However temporal distance does not necessarily mean that specific events cannot be generated when set far away in time. Participants have been asked to write as many events as they can think of that will take place at a distance of one day and one year in the future. Results showed no effect of time on the number of events generated (n = 9) or self-ratings of how realistic these events were, which could be seen as analogous to belief in occurrence (Study 2, Liberman, Sagristano & Trope, 2002).

Goal-related prospection has been shown to vary by distance so that event

clusters up to one month in the future are rated as less important and less goal-related compared to event clusters set 1–5 years ahead (D'Argembeau & Demblon, 2012). As noted by these authors, it is important for future research to identify the organizational principles other than personal goals that structure the temporal distance of prospective thoughts (p.166). When goal-related events are temporally close, personal plans are the designs we construct to guide our attempts to reach a goal in a given environment (D'Argembeau, Renaud & Van der Linden, 2009; Kofsky, Scholnick & Friedman, 1993). Based on the literature reviewed in Chapters 1 and 2, vividness of prospection for a goal might be expected to drop as temporal distance increases. The present study sought to examine the extent to which goals vary on the basis of belief and temporal distance. Close cues were self-chosen scenarios for which participants either did or did not hold current plans at a distance of two weeks in the future. The method for obtaining distant cues was taken from previous research which has examined the difference between own and other-generated goals (Lehner & D'Argembeau, 2016)

Lehner & D'Argembeau looked at goal-related future events vs. experimenter-provided (goal neutral) events vs. atemporal events and found similar levels of detail and vividness but stronger autonoetic experience in own goal-related trials. Further, autonoetic experience was strongly predicted by the importance of imagined events for personal goals. Not only do goals tend to be seen as important but also more desirable. The desirability of events influences scene construction in episodic future thinking. Desirable events are easier to envisage, are more associated with life scripts, contain more internal details and are clearer in terms of sensory and spatial components (de Vito et al., 2015). The evidence that contextual information is a more important cue compared to the richness of accompanying perceptual information when people rate belief in their own memories is a long-established feature of memory characteristics (Johnson et al., 1988). However, contrasting the contextual and perceptual features of believed and not believed future events set close and distant in time may not have the same relationship to belief in occurrence of a memory. On this basis, it could be predicted that events set

one year ahead might differ on sensory and contextual variables compared to events set within the next two weeks. However de Vito et al. found that experimenter-generated contrasted with self-generated events led to highly similar proportions of events set one year ahead (26%) and on the same day (28%). All self-generated events were more self-relevant (although not more detailed).

In the present study, cues were derived from participants' current plans for events at a distance of two weeks and one year. The study set out to see if the salience of intended future events at a distance of two weeks found in study 1(b) could be replicated at a distance of one year into the future. Thus the phenomenology of salient and not-personally salient future events at two distances from the present was examined. The method for temporally close events was taken from study 1(b). The next step was to identify suitable stimuli for salient and not salient goal cues at a distance of one year into the future.

5.2 Study 3(a)

Introduction

A suggested taxonomy of future thinking is that it is the means by which individuals can identify goals, make predictions, simulate options and create or adjust personal plans (Szpunar, Spreng & Schacter, 2014). The capacity to access a subjective sense of the self in the future allows the sampling of a range of scenarios in order to align planned behaviour with current goals (Baumeister, Vohs & Oettingen, 2016). The ability to generate such plans may be hampered by a tendency to overgeneral future thinking and in depressed individuals, a difficulty in accessing positive events in the future (Anderson & Evans, 2015; MacLeod & Byrne, 1996). Where such difficulties are not experienced, the remembering-imagining system enables us to live in the present moment with a heightened sense of vividness and accessibility for temporally-close events, particularly when these are allied to current goals (Conway, Loveday & Cole, 2016).

Even at a distance of 2-5 years, whether cued directly or by involuntary means, thoughts that are related to current goals are more vivid, more emotionally intense, are seen as more important to one's life story, have the capacity to improve current mood, and are also more rehearsed than thoughts that are not related to current concerns (Cole & Berntsen, 2016). MacLeod (2017) defines goals in this context as sitting in a hierarchy suggested by Emmons (1986). Specific behaviours, plans and goals are slave to higher-level values and needs. Current concerns are synonymous with goals but these sit within a top down architecture that is effectively an operating system to align fine grain sized plans and behaviour with higher order values and needs.

Autobiographical memory is the repository for the experienced past (Conway, 2005; 2009). When thinking about the future, from an early age, expectancies about what the future holds tend to be arranged around significant anticipated milestones described as cultural life scripts (Rubin, Berntsen & Hutson, 2009;

Bohn & Berntsen, 2013). Key life events such as graduation, career, marriage and family will be nominated and rated as important and generally positive but are typically represented with a low level of detail. There is strong evidence that future goals impact on the vividness of mental time travel but the exact nature of the heightened subjectivity of thinking about events that are really believed to occur has been less examined and is less understood.

When asked to access and describe personal goals, people call up a representation of the future that will be a synthesis of self-knowledge, event knowledge and expectancies. At the level of cognition, this has been hypothesised as prospection contextualised within a framework shaped by semantic and schematic knowledge (D'Argembeau, 2016). The autonoetic component that confers a sense of realness and belonging in this vision of the future is less well understood (D'Argembeau, 2016; Klein, 2013; 2016). Autonoesis has been suggested to be a meta-cognitive judgement not related to belief in occurrence when these self-ratings are made about events set in the past (Rubin et al., 2003). In their study, Rubin and colleagues examined the qualities of belief in occurrence on three strict criterion: would the participant be willing to testify in court that a memory was true (*testify*), would another witness with a different memory be able to sway that belief (*persuade*), and to what extent the participant rated the accuracy of their own memory (*accuracy*). While admirably precise, this type of psycho-legal meta judgement would be difficult to apply to future events. In the present study, all cues were plausible events but believed events were self-selected on the basis the participant believed they were going to occur. In the near future, they should already be in the person's diary or calendar. Distant future believed events were events the person was already working towards and saw themselves carrying out in one year's time. The type of events referred to as goals in psycho-legal research tend to set close in time and the use of the term goal seems to relate more to achievement of a task (Mac Giolla, Granhag & Ask, 2017). In episodic memory and future thinking research, goals are less detailed but more important events and fit into a hierarchy in which they are worked towards from the present in the form of realising related plans. In study 3, events were plausible and salient representations of

the self at two time points: two weeks and one year forward in time and these were self-rated in order to show how the perceptual and contextual characteristics of personal events varied on the basis of salience and temporal distance.

Experimenter-derived goal cue categories confer the advantage of better control of stimuli, analyses and results but at the potential cost that methodologies may not tap into personal salience. For example, Knez (2017) investigated goal-related mental time travel with participants in their 20s who were grouped by developmental maturity (Arnett, 2000): conceptualised as emerging adulthood (*M* = 22, range 19–25) and entering adulthood (*M* = 28, range = 26–32). Both groups were asked to generate as many past and future personal goals as possible at a distance of 1 year and 5–10 years into the past and future. Goal cue categories were taken from previous research: *home*, *work/education*, *money*, *social life*, *close relationships*, *health/fitness*, and *emotions/feelings* (Rapp, 1998; Vincent, Boddana & MacLeod, 2004). Results indicated that health and fitness was the most important goal at a distance of one year into the past or future. At a distance of five years into the past, both age groups rated education as their most important goal but there were no differences between longer-term future goal categories when thinking 5–10 years ahead.

This lack of difference in longer-term goal orientation may have been an artefact of task difficulty, which was not explicitly measured in this study. Goals 1 year versus 5 years ahead were rated as more probable and easier to imagine and represent. Older compared to younger participants gave higher ratings for pre-experiencing future life goals, which was explained as evidence that individuals going through entering as opposed to emerging adulthood are more involved in mental monitoring of their personal future. It was suggested that this could be explained by group differences in maturation of frontal lobe structures, which are responsible for reasoning and planning (Dahl, 2004). These results might suggest that goals related to health and fitness are the most available to individuals in their 20s and memories for past educational attainment were the most available previous achievements but

the results say less about the constituent components of representations of salient and not salient goals.

A pilot study was carried out to investigate items suitable for use as stimuli in the not salient, distant future condition in study 3. For study 3(b) a range of cue items were required that represented feasible but not currently salient personal goals. The pilot was designed to collect non-salient goal stimuli by two methods. The first method obtained a sample of self-generated personal goals from UK first year undergraduate students; the second method assessed whether a list of goals generated by US students in previous research was salient for students based in the United Kingdom (Gerlach, Spreng, Madore & Schacter, 2014).

Method

Participants

Twenty-six current or prospective undergraduate students were approached through personal contacts. Fourteen participants (3 males) aged 17-22 (M = 19.2, SD = 1.7) completed the full study. Three were current undergraduates at UK universities and 11 planned to go to university within one year. None of the participants in the pilot study also took part in the main experiment.

Materials and Procedure

The study was presented on Survey Gizmo software (www.surveygizmo.com). After reading an information sheet about the study, participants indicated consent to participate by moving forward from the first page. The next section required five personal goals to be nominated, defining goals as things that were *personally important projects that you frequently think about, that you make plans for and work to achieve* (Emmons, 1986; Little, 1983). Instructions were taken from previous research in which participants provided their own goal cues (Lehner & D'Argembeau, 2016). Personal goals could relate to any area of life including college or university; work; family; intimate relationships; material goods; and leisure activities but

should not be habitual activities, or significant milestones such as marriage or graduation. After nominating each goal, participants gave four examples of steps by which the goal might be realised and four examples of events that might come about as a result of having attained that goal. An estimate for when each goal might be achieved was made in weeks/months. Personal importance and desirability of the goal were indicated on a Likert scale using a vertical slider (scale: 1 = *low*, 100 = *high*).

The second part of the study was a rating task for goals taken from previous research. A list of 96 goals that had been generated by students in the United States was first edited for salience (Gerlach et al., 2014). Modifications included 11 items reworded to UK English; for example, *keeping a journal* was changed to *keeping a diary*. Seven items were excluded, as they were culturally specific to life in the United States, e.g. *watching the New Year's Eve balldrop in New York City* and *cooking a Thanksgiving turkey*. Other exclusions included 11 items that were seasonally specific and thus not generalizable as cues for events set one year in the future from the planned time of testing (e.g. *going apple picking)* or represented a potential confound with temporally close cues to be used in the main experiment. For example, *baking a cake* (potential distant cue) was similar to *cooking a new recipe* (close cue). The remaining 78 goals were presented in four blocks of five. First each item was rated for personal salience (*this is a goal for me*). Instructions defined goals as *events that you actively work towards and which are plausible (i.e. not impossible), based on where you are in your life right now and your existing plans*. The same blocks were then re-presented for rating on ease of mental imagery (*When I close my eyes it is easy for me to generate a mental image of myself doing this*). Agreement in both cases was indicated on a five-point Likert scale (*strongly disagree*, *slightly disagree*, *neither agree nor disagree*, *slightly agree*, *strongly agree*). Finally, four demographic questions on age, gender, ethnicity, and level of educational attainment were presented, along with an opportunity for participants to leave contact details in order to enter a prize draw to win a £100 Amazon voucher.

Results and Discussion

Own goals. A total of 64 goals were provided by 14 participants. Items were discarded where fewer than four steps to realise the goal or fewer than four events associated with having attained the goal had been provided. Further exclusions were made on the basis of temporal distance, where the attainment date lay outside the 12-18 months constraint for distant future cues in the main experiment. In four cases this was unspecified (*e.g. a long time*). The majority of goals exceeded 18 months, (n = 25, range: 22 months–70 years). Others were too close, (n = 16, range: 2–10 months). The list of goals before exclusions is presented with goal attainment estimates, importance and desirability ratings in Appendix G. After exclusions, 12 items remained and are presented in Table 5.1

Table 5.1

Study 3(a) Personal Goals Expected Attainable in 12–18 Months with Importance and Desirability Ratings

Description	Imp[b]	Des[c]
Have a successful relationship with my current partner	100	89
Try to be happier and be less hard on myself	100	86
Go travelling after I finish my Art Foundation Diploma	100	100
Keep fit - get fitter	89	89
Run a half marathon and get physically fitter	76	60
Convert to being a vegan	88	85
Gain enough confidence to perform at least once in front of an audience	60	85
Become more motivated about my degree course	89	70
Make and sell more earrings	68	61
Get a promotion within the next year	91	100
Complete my law degree and get a good grade	81	87
Be able to pay the bills and have savings	90	94

Note: [b] Personal importance; [c] Desirability; Scales: 1–100

Other goals. Mean ratings for goal salience and imageability were calculated from participants' ratings. Items receiving mean scores below the mid point for

either measure were excluded. Goals receiving mean scores for salience and imageability above the mid point of the scale are presented in Table 5.2.

Discussion

Most of the *own goals* generated did not meet the constraints of attainment in 12–18 months and the 4-step validation criteria for goal evidence and goal attainment. The final list comprised 12 items. Many of these items were desirable to the extent that it seemed unlikely they could be chosen as not-current goals by a student population (*e.g.* getting fitter, going travelling, becoming more motivated or more successful in work or studies). The list did not constitute a sufficiently large pool to be suitable for use as a source for not-currently salient, one-year distant cue in study 3(b).

In some ways, the opposite distinction was true of the goals taken from previous research. This list was long and contained many items that would be unlikely to be planned for at a distance of one year ahead (e.g. *having a picnic in a park).* Using this list could lead to variance in the extent to which cues were imageable and plausible when compared to own goals set one year ahead. The range of events was somewhat schematic, event-based and did not reflect the range of idiosyncratic and idealized items that had been nominated as *own goals* (e.g. *be able to pay the bills and have savings*, *convert to being a vegan*). To reiterate, the aim of study 3(a) was to find items that could populate a menu from which every participant could select a goal that was personally plausible and potentially vivid when thought about from a current vantage point to a distance of one year ahead but which was not currently salient as a personal goal. The goals that participants would generate for themselves in study 3(b) were anticipated to incorporate difficult-to-capture elements that reflected the culture of this group of individuals at this university at this moment in time. An alternative means by which to generate plausible, not-current goals would be to identify typical current goals within the population from which the sample would be drawn. On this basis, goals generated by other participants in the same study was considered as a

means by which to generate suitable cues. This observation led to a re-evaluation of the planned method for study 3(b).

The decision was taken to reject both lists generated in study 3(a) on the basis that a more controlled method by which to control the plausibility and imageability of goals in study 3(b) would be to use real goals generated by other people taking part in the same study. Using this method would provide a range of goals that would not exclude the idiosyncratic (e.g. *make and sell more earrings*) nor more idealised items (*e.g. get a promotion*), without sacrificing plausibility. These were validated as current and plausible by the fact of their genesis as salient goals suggested by others in the same experiment. This allowed more direct comparison of salient and not-salient, one-year distant simulations. Thus the decision was taken to use goals nominated by participants in the first phase of study 3(b) as a menu to be offered to other participants, from which they could choose items that were not-current goals for themselves. When presented with a list of possible cues, the first item to be rated as 1 or 2 in salience (*not a goal for me*) was used as the stimulus in the non-salient, temporally distant future condition in study 3(b).

Table 5.2.

Study 3(a) Salience and Imageability of Goals Generated in Previous Research

Goals	*Salience* *M*	*Imageability* *M*
Acing an upcoming exam	4.14	3.93
Adopting a pet	4.07	3.86
Applying for jobs after graduation	4.00	3.93
Becoming a better swimmer	3.21	3.71
Being at a friend's wedding	4.29	4.14
Being present at a friend's important event	4.64	4.57
Cleaning out your room	4.29	4.14
Creating a blog	3.21	3.07
Donating some blood	4.00	4.14
Eating healthier food	4.71	4.43
Finding a cosy flat	4.43	4.14
Finding a great roommate	4.36	3.64
Finding new music you like	4.29	4.07
Getting an internship	3.50	3.57
Going camping in the forest	4.29	4.57
Going hiking in the mountains	4.29	4.29
Going ice skating	3.00	3.36
Going on a date	3.86	3.79
Going on a family holiday	4.14	4.43
Going on a road trip	3.93	4.43
Going to an amusement park	3.21	3.57
Growing a garden	3.79	3.57
Having a better sleep cycle	4.71	3.79
Having a bonfire	4.14	4.29
Having a picnic in a park	3.93	4.50
Helping a stranger	4.29	4.36
Helping as a volunteer	4.00	3.50
Improving your skin	4.00	3.57
Improving your wardrobe	4.21	4.29
Investing your money	3.79	3.29
Joining a student club	3.64	3.43

Keeping a diary	3.64	3.79
Keeping in touch with a relative	4.50	4.00
Keeping up with the news	4.29	4.14
Learning a musical instrument	4.00	3.64
Learning how to paint	3.93	4.21
Learning to do yoga	4.43	4.36
Learning to perform CPR	3.64	3.57
Losing a few pounds	3.14	3.64
Making a photo album	3.57	4.14
Making new friends	4.79	4.29
Managing your money better	4.43	3.79
Reading for pleasure	3.86	4.43
Seeing a West End show	3.57	4.00
Sorting out old clothes	4.14	4.64
Throwing a surprise party	3.57	3.71
Traveling to a foreign country	4.86	4.64
Traveling to Paris	3.21	3.43
Visiting a museum	4.14	4.64
Visiting family in a different part of the country	4.36	4.14
Visiting your secondary school teachers	3.14	3.43
Voting in an election	4.50	4.71
Walking/ running for charity	3.43	3.29
Writing a short story	3.29	3.50

Note: Goals taken from (Gerlach et al., 2014.). Rating Scale*: 1 (Low), 5 (High)*

5.3 Study 3(b)

Method

Design

The personal salience of future episodic thinking was investigated in a 2 (*near future, distant future*) x 2 (*salient, not salient*) within participants design. Stimuli were adapted from previous research (Study 1b; MacLeod & Conway, 2007; Lehner & D'Argembeau, 2016). The experiment took place in two sessions. An online task required participants to nominate personal goals for themselves and others. These items were used to generate cues for the second phase of the study. One day to one week later, participants came to the laboratory where they simulated, described and recorded four future events: 2 temporally-close (salient, not salient) and 2 temporally-distant (salient, not salient). After each simulation, a questionnaire on the phenomenological qualities of the simulation was completed. Measures of ease of mental imagery and current mood were also taken.

Participants

The sample consisted of 34 undergraduate students (six males) with a mean age of 19.18 (*SD* = 1.91). Goal-related cues lead to more vivid mental time travel in younger compared to older participants (Lapp & Spaniol, 2017). To control age effects and to constrain the salience of distant cue stimuli, participation was limited to first year undergraduates at Royal Holloway, University of London. Testing was carried out over one month during the first semester of the academic year, thus future events set at a distance of one year would take place when the full cohort would expect to be entering their second year of study. Participation was in exchange for course credits. One participant reached the ceiling for credits halfway through testing and received payment of £10 in lieu.

All participants were fluent English speakers, 10 reported that they spoke a different language before the age of five years. Ethnicity was self-identified as Asian (14) or white (20). One participant did not follow instructions during the experiment and was excluded from all analyses (N = 33). One participant with missing data was excluded from analyses of mental time travel and overall autonoetic consciousness (n = 32). A second participant with missing data was excluded from analyses of simulation time (n = 32).

Materials and equipment

Temporally distant event stimuli. The procedure for generating temporally distant cue items was adapted from previous research (Lehner & D'Argembeau, 2016). A questionnaire was designed on Survey Gizmo software (www.surveygizmo.com). After viewing an information sheet and answering questions on age and gender, a set of instructions outlined the criteria for choosing five personal goals:

> *In this study, we are interested in things that really matter to you and that you see yourself moving towards over the next year. We want you to write five of these down, in no particular order. Think of things that are important to you now and that you want in place by this time next year, rather than major life events that are further ahead such as graduation or getting married. We are interested in knowing about things that you really hope to make happen in the next year or so, no matter how important or trivial these could sound to other people. These goals can relate to any area of your life, not just your education but your hobbies, your family, your health, your relationship or anything else.*

For each item, participants provided a short description, elaborated on the next step towards achieving the goal, rated importance and desirability on 7-point Likert scales: 1 (not at all), 7 (extremely) and provided an estimate of

when the goal might be achieved goal might be attained (*6 months)*, (*12 months)*, (*18 months)*, (*other - write in*).

Next, participants were asked to list five goals that other people who had also taken part in the task might nominate under the same criteria. Importance and desirability ratings for each hypothetical other person's goal were made on 7-point Likert scales. Estimates for the time when the goal might be attained (by the other person) were made. The final phase of the online questionnaire presented a short version of the VVIQ (Marks, 1973).

The personal goal receiving the highest rating (at least ≥ 6) was used as the *salient, distant* cue in the main experiment. The other-person's goal that received the lowest rating (at least ≤ 2) was selected for use as the *not-salient, distant* cue in the main experiment. In cases where all the hypothetical other people's goals were also personally important to the participant (ratings >3), an alternative procedure was followed. In the second phase of the experiment, a list of personal goals that had been nominated by other participants in the same experiment was presented to that individual. The first item to be rated as low in personal importance (≤ 2) was used as the cue in the not salient, distant condition. The list was randomised between participants and was replenished by new *other people's goals* over the weeks of data collection.

Temporally close event stimuli. Cues where chosen from a list of events controlled for personal plausibility, frequency (*in any two-week period*) and ease of mental imagery among UK students aged 18-30 (Study 1A, Pilot Study 4). The list consisted of 10 items:
Invite someone round and cook dinner for them; *Attend a progress meeting at work/college*; *Meet a friend for coffee*; *Meet a friend in a pub or bar*; *Go to the cinema*; *Attend a specific club night or event*; *Go to a friend's house to watch a film*; *Stay in with a friend/partner/family member and share pizza and a movie*; *Work out in a gym or at a fitness class*; *Try making a new recipe that you have never cooked before*.

Participants chose one event that they had existing plans to carry out in the next two weeks (*salient*, *close*); and one event that the participant had no existing plans to undertake in the next two weeks or for the foreseeable future (*not-salient*, *close*). For a more detailed description of the method, see the method section of study 1(b).

Phenomenological Characteristics Questionnaire. This is a 24-item scale based on a measure used in recent research on prospection (Lehner & D'Argembeau, 2016, Study 1b). The scale was originally adapted from the Emotion Regulation Questionnaire (ERQ) (Gross & John, 2003), Memory Characteristics Questionnaire (Johnson, Foley, Suengas & Raye, 1988), Vividness of Visual Imagery Questionnaire (VVIQ) (Marks, 1973), and the Autobiographical Memory Questionnaire (Rubin, Schrauf & Greenberg, 2003).

The characteristics of each scenario were rated on a Likert scale: 1 (*low)*, 7 (*high*). Two questions asked about clarity: one centred on the overall clarity of the representation, the second asked about the clarity of the location where the event would take place. Six questions probed the richness of the representation: visual details, sounds, smells, taste and/or touch and spatial arrangement of people and objects. Two questions centred on autonoetic experience: the sense of pre-experiencing the event and the degree to which a sense of mental time travel was experienced. Three questions related to more general properties of the event: prior experience of a similar event, familiarity of the location, and familiarity of people and objects. Five questions centred on self-narrative: personal importance, rehearsal (*I have thought about this event before*), emotional valence, the extent to which other specific events came to mind at the same time and personal plausibility, (*this event could plausibly happen to me*). Four questions served as manipulation checks: global plausibility of the event (*could plausibly happen to anyone*), desirability, task difficulty and the self-rated likelihood that the event would occur in the future. The full measure is reproduced in Appendix I.

PHQ-9 Depression Scale (2001). The Patient Health Questionnaire (PHQ-9) is a nine-item, self-report inventory of low mood (Kroenke, Spitzer and Williams, 2001). Depression severity is calculated by assigning scores of 0, 1, 2, and 3, to four response categories (not at all, several days, more than half the days and nearly every day). Scores for the nine items are summed, giving a range from 0 to 27. Scores of 5, 10, 15, and 20 are cut offs for mild, moderate, moderately severe and severe depression, respectively (Kroenke & Spitzer, 2002).

Vividness of Visual Imagery Questionnaire (VVIQ) (Marks, 1973; Zeman, Dewar & Della Salla, 2015). People who find it easier to see pictures in the mind's eye also report more vivid experiences of prospection. Individual differences in the ability to generate visual imagery can lead to variation in spatial representation, emotional intensity and sense of mental time in memories and future thoughts (D'Argembeau & Van der Linden, 2006). Individual difference in mental imagery capacity may impact on the subjective experience of simulating intended and not-intended future events (Knieps et al., 2013). To investigate the ease with which mental imagery can be generated and its relationship to the phenomenology of prospection to the close and distant future, participants were asked to complete a 16-item, self-report measure of ease of mental imagery (Zeman, Dewar & Della Salla, 2015). Mental imagery is generated and refined in response to four scenarios. For example:

> *Visualise a rising sun and look carefully at the details of that mental picture; how clearly do you see that sun rising above the horizon in a hazy sky?*
>
> *Imagine the sky clearing and surrounding the sun with blueness, how vivid is that image?*
>
> *Clouds appear in your sky and a lightning storm erupts - how well can you see it?*
>
> *A rainbow appears in your sky, how clearly can you make it out?*

Answers are made on a scale from 1 (as vivid as real life) to 5 (no image at all). Scores are summed giving a range from 1 to 80, with lower scores indicating more detailed mental imagery. The direction of the scoring procedure is consistent with the original VVIQ (Marks, 1973) but is the reverse of the scoring procedure for the VVIQ2 (Marks, 1995) and other research employing short forms of this measure, (D'Argembeau et al, 2006; Zeman et al, 2015).

Simulation properties. Previous research has shown that closing eyes during memory retrieval increases the number of visual and auditory details recalled (Perfect et al., 2008). Thus participants were instructed to close their eyes and wore Sennheiser HD-201 headphones to reduce ambient noise during each simulation. Latencies to generate each scenario were measured using a Robic SC-606 stopwatch. Verbal descriptions of simulations were recorded on an Olympus WS-852 Digital Voice Recorder. Each participant generated four recordings, to which literal verbatim transcription was applied. A computer-based count was made of the number of words uttered and the number of fillers (*er*, *erm*). Examples of transcripts are presented in Appendix J.

Procedure

The study was submitted and approved under the ethical procedure in place at Royal Holloway, University of London. Participants were invited to sign up via the University's internal Experiment Management System. In the first phase, an invitation was sent to complete the online phase of the experiment. On completion, participants received two course credits and an invitation code by which they were able to book a slot to take part in the second phase of the study, one to seven days later (M = 4.53 days, SD = 1.56).

The second phase of the experiment took place in a quiet office within the Department of Clinical Psychology at Royal Holloway, University of London. Detailed instructions were given and discussed to ensure that each participant

fully understood the term *episodic future thinking* and the difference between this and *episodic memory*:

> *The scenario you generate should be something that has not happened to you before. We want it to be a unique imagined future event rather than a memory recast in the future. You can be creative, but you cannot be totally unrealistic, so you can't tell me about going to the moon, for example.*

Practice trials were run for temporally distant and temporarily close future events cued by two sample events: *attending a birthday party, lying on a sunny beach*. When participants indicated that they understood the procedure, the experimental trials began. The following instructions were read to the participant at the beginning of each trial.

> *I would like you to travel forward in time to simulate a specific occasion that comes to mind when you think about this cue and that will last over an hour and under one day, in the next two weeks/a year from now. Close your eyes and try to experience the event in your mind. Notice the setting, the way things happen, any people and objects present, any sensory details. Try to explore what it will be like to be there in as much detail as you can. Take as long as you need. When you have thoroughly explored the scenario and you are ready to stop, just open your eyes and say finished.*

Time to simulate was not constrained. Latencies were recorded in m/s using a stopwatch. Participants wore Sennheiser headphones during simulations to reduce any ambient noise. Immediately after each simulation, participants described the event in as much detail as possible (audio-recorded). When descriptions were short, participants were given one prompt

> *Is there anything else you can tell me about the simulation?*

The experimental running order was randomised. After each verbal description of the event was recorded, participants completed a

Phenomenological Characteristics Questionnaire. When all four simulations, verbal descriptions and questionnaires had been completed each participant completed the PHQ-9 inventory. Participants were thanked, debriefed and allowed to leave. Total testing time was 60-75 minutes.

5.4 Results

Analyses were carried out using multilevel modelling using the nlme package in R (Pinheiro, Bates, DebRoy, Sarkar and R Core Team, 2017). In episodic memory and prospection research, data cannot be assumed to be independent. Multilevel modelling adds an extra error term, which constitutes the error between participants (Wright, 1998). To test the significant of main effects and interactions, one effect is added at a time and the models are compared. A significant change in model fit as measured by χ^2 indicates a significant effect. The R squared statistic gives an indication of effect size (Wright and London, 2009).

The protocol for the experiment is presented in Appendix H. An overview of the variables with the accompanying questionnaire text for each question is presented in Appendix I. Means by experimental condition, standard deviations and interactions are presented in Table 5.3. A summary with the means for main effects and statistics for planned comparisons follows.

Table 5.3

Study 3b: Descriptive & MLM Statistics for Phenomenological Measures by Salience and Distance

	Two Weeks Future		*One Year Future*		*Main effects & Interactions*				
	Salient	*Not Salient*	*Salient*	*Not salient*	*S vs. NS*		*C vs. D*		*Interact.*
Measures	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	χ^2	R^2	χ^2	R^2	χ^2
Autonoetic									
Pre-experiencing	5.67 *(1.27)*	4.52 *(1.48)*	5.52 *(1.54)*	4.52 *(1.54)*	18.62***	.12	.08	0	.10
Mental time travel	6.13 *(.87)*	3.19 *(1.91)*	5.72 *(1.35)*	3.22 *(2.06)*	72.65***	.42	.26	0	.70
Autonoetic (M)	5.92 *(.90)*	3.82 *(1.37)*	5.66 *(1.23)*	3.83 *(1.50)*	61.06***	.37	.15	0	.55
Phenomenological									
Clarity	5.97 *(.98)*	4.55 *(1.39)*	5.45 *(1.39)*	4.39 *(1.78)*	27.89***	.02	1.77	.01	.71
Location	6.33 *(1.14)*	5.21 *(1.75)*	5.79 *(1.41)*	4.55 *(1.94)*	20.40***	.12	4.97*	.03	.09
Spatial	5.79 *(1.41)*	4.79 *(1.71)*	5.30 *(1.31)*	4.12 *(1.93)*	16.96***	.10	4.44*	.03	.06
Visual	6.03 *(1.19)*	5.61 *(1.39)*	5.85 *(1.09)*	5.64 *(1.41)*	4.01*	.02	.22	0	.46
Auditory	5.39 *(1.68)*	4.46 *(1.86)*	4.18 *(2.21)*	3.49 *(1.89)*	7.19**	.04	13.16**	.07	.19
Olfactory	4.42 *(1.97)*	4.30 *(1.91)*	3.15 *(2.06)*	2.52 *(1.82)*	1.26	.01	22.93***	.14	.75
Gustatory/tactile	4.12 *(2.25)*	3.33 *(1.85)*	3.33 *(2.03)*	2.88 *(1.80)*	4.93*	.02	4.93*	.10	.38
Overall Sensory	5.44 *(1.03)*	4.61 *(1.12)*	4.72 *(1.19)*	3.94 *(1.25)*	20.31***	.11	14.41***	.08	.02
Event properties									
Prior experience	5.36 *(1.64)*	3.36 *(2.07)*	3.76 *(2.09)*	2.09 *(1.59)*	29.08***	.18	16.90***	.11	.55
Location familiar.	5.94 *(1.58)*	4.39 *(2.56)*	5.33 *(1.98)*	3.58 *(2.39)*	19.28***	.13	3.31	.02	.09
People/Obj. fam.	5.79 *(1.80)*	4.27 *(2.10)*	5.18 *(1.99)*	4.09 *(2.26)*	15.06***	.09	1.29	.01	.44

*$p \leq .05$ **$p \leq .001$ *** $p \leq .0001$; For all χ^2 statistics, $df = 1$, $n = 132$ except Autonoetic and Mental time travel, $df = 1$, $n = 128$.

Table 5.3

Study 3b: Descriptive & MLM Statistics for Phenomenological Measures by Salience and Distance

	Two Weeks Future		*One Year Future*		*Main effects & Interactions*				
	Salient	*Not Salient*	*Salient*	*Not Salient*	*S vs. NS*		*C vs. D*		*Interact.*
Measures	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	χ^2	R^2	χ^2	R^2	χ^2
Self-Narrative									
Importance	4.61 *(1.75)*	2.00 *(1.50)*	6.30 *(.95)*	2.15 *(1.70)*	99.69***	.53	5.30*	.04	9.91**
Emo. Valence	5.79 *(1.43)*	3.76 *(1.66)*	5.58 *(1.56)*	3.85 *(1.46)*	43.43***	.28	.04	0	.35
Cued Recall	4.64 *(1.75)*	3.33 *(1.96)*	3.88 *(1.93)*	2.79 *(2.07)*	15.95***	.09	4.46*	.03	.14
Life in General	3.09 *(1.97)*	2.30 *(1.33)*	3.91 *(2.01)*	2.46 *(1.60)*	17.89***	.09	3.11	.02	1.82
Pers. Plausibility	6.42 *(1.03)*	3.91 *(1.89)*	6.00 *(1.15)*	3.18 *(2.13)*	71.02***	.40	2.51	.02	.35
Content									
Simulation Time (Range: 7.60–263.03)	67.24	72.15	80.56	75.11	.01	0	4.36*	.01	1.82
Word count (Range: 33–468)	169.76	158.02	166.06	163.09	.88	0	.01	0	.31

* $p \leq .05$ ** $p \leq .001$ *** $p \leq .0001$; For all χ^2 statistics, $df = 1$, $n = 132$ except Simulation Time, $df = 1$, $n = 128$.

Manipulation checks. Some of the variables were effectively checks for the manipulation of personal salience. Salient events were believed to be more likely to take place (M = 6, SD = 1.22) compared to non-salient events (M = 1.88, SD = 1.46). There was a significant interaction between salience and distance. Planned comparisons showed that when events were set in the next two weeks, salient events were rated as more likely to take place than not-salient events, $\chi^2(1, N = 66) = 121.93$, $p < .0001$, $R^2 = .84$. Not-salient events close in time did not differ in belief from not-salient distant events, $\chi^2(1, N = 66) = .98$, $p = .32$, $R^2 = .01$. At a distance of two weeks, salient events were judged more likely to take place compared to salient events one year in the future, $\chi^2(1, N = 66) = 15.82$, $p < .0001$, $R^2 = .18$.

Events set closer in time were seen as more globally plausible (M = 5.76, SD = 1.23) compared to distant events (M = 5.20, SD = 1.77. There was no difference in global plausibility between salient (M = 5.70, SD = 1.46) and not-salient events (M = 5.26, SD = 1.60) and there was no interaction. By contrast, salient events were significantly more *personally* plausible, (M = 6.21, SD = 1.10) than non-salient events (M = 3.55, SD = 2.03. There was no difference in personal plausibility as a function of time: close events (M = 5.17, SD = 1.97) were no more personally plausible than distant events (M = 4.59, SD = 2.21). The contrast between global and personal plausibility suggests that events were not fantastical.

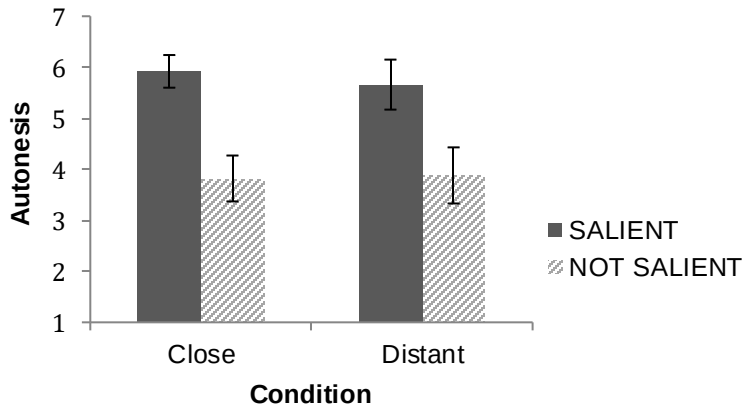

Figure 5.1. Study 3(b) autonoetic consciousness by salience and distance.

An overall score for autonoetic consciousness was calculated from the means for *mental time travel* and *feeling of experiencing* (Lehner & D'Argembeau, 2016). The correlation between mental time travel and feeling of experiencing was moderate but significant, Pearson's $r(128) = .51$, $p \leq .001$, 1-tailed. Figure 5.1 shows mean ratings for autonoetic consciousness during close and distant true and false trials. Salient events ($M = 5.79$, $SD = 1.43$) were associated with more autonoetic consciousness than not-salient events ($M = 3.85$, $SD = 1.43$. There was no effect of temporal distance and no interaction. This pattern of results was true for separate analyses of the two components of autonoetic consciousness: the feeling of really being there at the event and the sense of going into the future and finding the self at the time the event would happen. For both questions, there was a main effect of salience but no effect of time and no interaction.

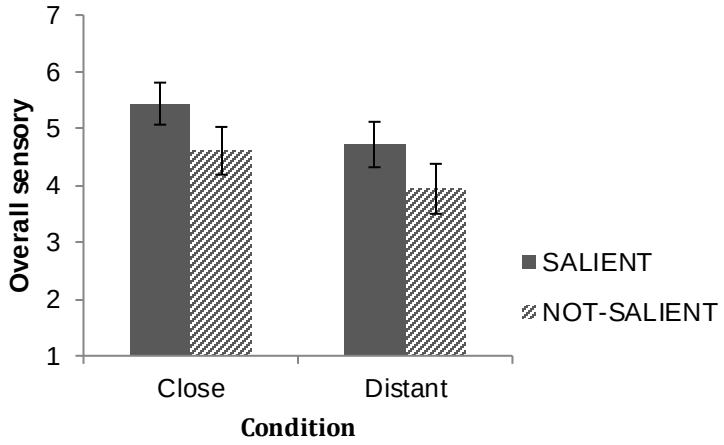

Figure 5.2. Subjective vividness by salience and distance.

A single index of overall subjective vividness was calculated from the mean of the variables clarity, visual, location, sounds, smells, taste/touch and spatial, (Cronbach's Alpha = .83). Overall sensory ratings were higher for salient events (M = 5.08, SD = 1.16) than not-salient events (M = 4.27, SD = 1.22. Overall sensory ratings were also higher for events two weeks in the future (M = 5.02, SD = 1.14) than for events one year in the future (M = 4.33, SD = 1.27). There was no interaction.

Following the analysis of the combined vividness score, individual vividness ratings were analysed separately. Salient events, relative to non-salient events were rated higher for clarity, visual details, location, auditory, gustatory-tactile and spatial elements. Salient and non-salient events did not differ on olfactory ratings. Near and distant events did not differ on indices of event vividness, with the exceptions that near events showed a stronger sense of location and more olfactory elements than distant events. There were no significant interactions between salience and distance on any of the individual subjective vividness variables.

Event Properties. Salient events were associated with more familiar locations, people and objects and were more likely to have been

experienced before. Close events were also more likely to have been experienced in the past. There were no interactions between salience and distance on any of these variables.

Self-narrative. Salient events were significantly more positive in emotional valence, more important and personally plausible and were more connected to thoughts about life in general. Close events were less important than distant events. There was a significant interaction between time and salience in personal importance.

Simulation properties. Events close to the present took less time to simulate in milliseconds (M = 69.69, SD = 36.38) than distant events (M = 77.84, SD = 47.48) but did not differ by salience. There was no difference in the number of words spoken in the description of each simulation, suggesting that the overall amount of detail given by participants did not vary by condition.

Depression and Vividness of Mental Imagery. Depression measured by the PHQ-9 was mild to moderate (range: 1-25, M = 7.73, SD = 5.29). Four scores were ≥ 15, signifying moderately severe or severe depression. Scores on the VVIQ (Marks, 1973) fell in the range of 15-60, (M = 37.52, SD = 9.45). PHQ9 and VVIQ scores were covaried with analyses but there was no change to the direction and pattern of results.

5.5 Discussion

This study took the thesis away from the memory/future thinking contrast to examine the impact of belief in occurrence on goals and plans by contrasting these with plausible but not intended goals and plans. Results of sensory self-ratings indicated that salient events differed by intention but not by temporal distance in terms of clarity, visual details, location, and spatial elements. Close and distant events did not differ on indices of event vividness, except that near events showed a stronger sense of location and more olfactory elements than distant events. Salient events were associated with more familiarity in terms of locations, people and objects and were more likely to have been experienced before. Close events were also more related to past experience. Salient events were more positive in emotional valence, more important and personally plausible and more connected to thoughts about life in general. Close events were less important than distant events and were seen as more globally plausible than distant events whether or not they were truly anticipated. By contrast, salient events were more personally plausible than imagined events, whether at a distance of two weeks or one year. The contrast between global and personal plausibility suggests that all the events were credible, whether or not they chosen for the salient conditions.

The results of this experiment are unexpected. The goal-relatedness of prospection means that successful goal-striving not only brings goal attainment closer but also shapes and maintains a subjective sense of self across time, enabling a coherent narrative that extends from what was important in the past to what will be important in the future (Conway, 2005; D'Argembeau, 2016; Demblon & D'Argembeau, 2017; Rathbone et al., 2011). In particular, the literature has shown that there is a heightened salience for the just experienced and imminently anticipated, conceived as the remembering-imagining system (Conway et al., 2016). Within this framework, spontaneous future thoughts close to the present tend to

centre on specific personal planning whereas temporally distant thoughts are more related to cultural life scripts about *what other people like us* do across the lifespan (Berntsen & Bohn, 2009) or higher order goals such as autonomy, competence and relatedness (Ryan & Deci, 2000; 2017). Thus the finding that a salient personal goal at a distance of one year is subjectively experienced similarly to a personal plan within two weeks is somewhat at odds with recent literature in the field.

Construal theory suggests that anticipation of behaviour set further away in time is less detailed but is accompanied by a greater sense of certainty compared to near future plans (Nussbaum et al., 2006). Examining study 4 findings in light of construal theory, ratings of the event properties showed main effects of belief. Salient events were set in more familiar locations, were less novel and represented interactions with more familiar people and objects. There was also a main effect of temporal distance on novelty so that close events were less novel compared to distant events. This is not in line with previous findings that suggest atypical scenarios are less anticipated when events are set further ahead in time compared to close in time (Henderson et al., 2006). However study 4 does confirm earlier research showing that people can easily generate similar numbers of realistic personal events whether these are set close or distant in time (Liberman et al., 2002).

Previous research has suggested that events set one month ahead are less-goal related compared to event clusters set 1–5 years ahead (D'Argembeau & Demblon, 2012). Results of study 3 showed that intention can be extended from two weeks to map onto personal goals at a distance of one year. The sense of autnoesis for intended future events was elevated in prospection for salient events in the short-term future and for salient events set one year ahead. This finding that salience led to similar levels of autonoesis at both time points may have been related to the instruction that goals should be personal plans that were already being

moved towards in the current moment, a definition taken from literature emphasising the nature of personal striving (Emmons, 1986). Using this definition of a goal may have enhanced the orientation of prospection, making salient the connection between current plans and goals in the form of desired end states (Austin & Vancouver, 1996) at a distance of one year ahead.

The results of study 3 could suggest that indexing belief in occurrence led participants to perceive a link between short-term plans and longer-term desired end states. This may cue experiential dimensions of mental time travel, lending vividness to the subjective experience of temporally-close plans and temporally-distant desired end states (Mac Giolla et al., 2017b). Results showed that in salient trials, imminent events were more believed to be going to occur than distant events. Given that people have more contextualising information available to judge the likelihood that things will happen in the next two weeks compared to next year, this variance in belief makes sense. However on the basis of previous literature, this difference in levels of belief in occurrence of salient events might also be expected to have impacted on the autonoetic component of mental time travel between close and distant salient future events, which was not found in these data. Previous research has identified that autonoesis is predicted by the importance of events for current goals (Lehner & D'Argembeau, 2016). Study 4 confirmed this finding in that personal importance correlated with the combined autonoesis variable $r = .43$, $p = .01$. Looking in detail, this pattern held in the salient close condition, $r = .44$, $p = .01$ and the salient distant condition, $r = .35$, $p = .05$. There was no correlation between personal importance and autonoesis in not-salient conditions, whether close or distant. This pattern of results confirms that goal relatedness had a similar impact on the subjective experience of these events, regardless of temporal distance. The impact of belief in occurrence on autonoesis in the studies of this thesis is discussed further in Chapter 8.3i and 8.3ii.

The finding that belief in the occurrence of not-salient events did not create variance between close and distant events in the subjective phenomenological ratings is also an interesting result. It might have been expected that imagining a not-anticipated event close in time compared to more distantly in time would result in a stronger sense of autonoesis, but this was not the case. This might be a floor effect or it could be taken as evidence to suggest that in not-salient trials, participants were engaging in a mode of prospection that draws more on semantic than episodic knowledge to furnish the representation. Further investigation could be carried out by coding the content of transcripts for internal and external details to see whether these differ between close and distant, salient and not-salient events. This might be also be examined in an fMRI study to examine neural correlates of these processes. For example, recent research has found neural evidence of prospection that supports construal theory (Stillman, Lee, Deng, Unnava, Cunningham & Fujita, 2017).

In the context that holding a veridical intention to carry out an activity can be thought of as holding a goal for a desired end-state, it has been suggested that research contrasting prospection for goals and non-goals could help to extend psycho-legal research into the detection of deception about future events (Mac Giolla et al., 2017). Study 4b has shown that the vividness of prospection is changed by the extent to which the event being sampled maps onto believed goals. In particular, non-goal prospection elicited lower levels of autonoesis, regardless of temporal distance. In terms of sensory phenomenology, non-goals attracted lower self-ratings for clarity and visual details compared to goal-related prospection. In terms of the properties of the scenarios, non-goals were associated with less familiar locations and less familiar people and objects. This could be relevant to scenarios in which events were not anticipated but also not directly lied about. However, in most applied settings, the judgement being made is concerned with discriminating a lie from a truthful account. It could

be argued that a liar also holds a desired end-state goal (to be believed), making the potential application of the current findings less clear. In study 5 of this thesis, a deception paradigm is reported which may shed light on the extent to which the findings of the present study can be mapped onto a truth/lie design.

Episodic future thinking has been suggested to be intimately related to the maintenance and support of goals (Cole & Berntsen, 2016; D'Argembeau, 2016; Lapp & Spaniol, 2017; Lehner & D'Argembeau, 2016). Study 4 has supported this view by demonstrating the subjective differences between thinking about goal-related events and plausible but not goal-related events. To extend this research, it would be interesting to investigate how this varies in clinical and non-clinical depression. Depression may lead to difficulties in conceiving and maintaining links to a sense of the personal future (MacLeod & Byrne, 1996; MacLeod & O'Connor, 2018; Vincent et al, 2004). The regulation of current mood and its relationship to goal-directed future thinking is an ongoing area of research that draws on multiple aspects of cognition (MacLeod, 2017; MacLeod & Conway, 2007; Seligman et al., 2013). One possible direction for the findings from this study would be to see if simulating future events cued by personal salience differs in depression. Including non-depressed controls would also provide an opportunity to examine whether the pattern of results found in study 3 can be replicated. Individuals who experience intrusive thoughts about the future and the vividness with which salient cues might engage processes of mental time travel could shed light on cognitive mechanisms in anxious, depressed and other patient groups.

Another direction for this research might be to look retrospectively at personally important events set one year and two weeks in the past. Results of study 1d showed that transcripts of believed memories were rated by judges as more detailed than not believed events. Results of study 3 suggest a clear impact of personal salience on prospection but it

would be interesting to directly compare this to previous experience. In such a study, own vs. other peoples' events might be used as believed/not believed event cues at both temporal distances to cue plausible but not-salient goals and plans. Contrasting believed events at a distance of one year and two weeks in the past and future would allow direct comparison of variance between mechanisms of goal-directed mental time travel.

Chapter 6 Experimental Travelling in Time Too (Study 4)

6.1 Introduction

Interim summary

Autonoetic consciousness is the subjective sense of p/re-living a memory or anticipated event as vividly as if it were occurring in the present moment (Tulving, 1985). Study 1(b) in this thesis showed that mentally sampling an activity anticipated to take place in the next two weeks, or that had been experienced in the preceding fortnight, was characterized by a greater sense of autonoetic consciousness than could be elicited by merely imagining a temporally-matched, equally-frequently experienced activity. Having the intention to do something and believing that it will occur in the future makes that event qualitatively different to something that can be imagined but is not intended or believed to be going to occur.

Study 3 confirmed previous research that has shown that when set one year ahead, imagining an activity related to your personal goals is accompanied by a greater sense of autonoetic consciousness than visualising a similar event that does not have personal salience (Lehner & D'Argembeau, 2016). Study 3 demonstrated that events related to strong personal goals anticipated one year ahead are subjectively experienced as vividly as real plans set within two weeks, when measured by phenomenological self-ratings. These studies suggest a pattern of self-ratings showing subjective differences in veridical intention. In study 4, the salience of events in the near future and recent past was explored through phenomenological ratings and also asking participants to make drawings of believed and imagined events. In doing so, an attempt was made to create stimuli that could be presented for rating by judges. In study 4(c), judges with shared experience to participants who had made the drawings (hereafter called senders) viewed and rated the drawings. Measures were taken from psycho-legal research in which drawings of true and lied-about events have been compared. Ratings were obtained to see if the personal

salience of future events differentiated imagined from believed representations of events in the recent past and future when viewed by others.

Study 4

One avenue for recent research in future thinking and memory has been the extent to which episodic memory processes specifically support spatial elements of mental representations when thinking about the future (Hassabis, Kumaran, Vann & Maguire, 2007; Hassabis & Maguire, 2009; Maguire & Hassabis, 2011; Maguire, Intraub & Mullally, 2016; Maguire & Mullally, 2013). Another view is that episodic future thinking is more broadly related to a conceptual sense of the self across time in which semantic knowledge forms a framework within which memory for lived experienced is flexibly recombined to generate representations of the self in the future (Eichenbaum & Cohen, 2014, Schacter, 2012, Schacter & Addis, 2007). A recent distinction within future thinking literature has been to consider differences in mental time travel for believed and fictitious events (D'Argembeau & Demblon, 2012; de Vito, Gamboz & Brandimonte, 2012). The present study compares representations of the future drawings and phenomenological self-ratings for believed and fictitious events set in the recent past and near future. Interviews and self-ratings are frequently used to investigate mental time travel but such methods may miss spatial or conceptual aspects of autonoetic experience. Study 4 was based on the method from study 1(b) but in a novel application of the drawing method sometimes employed in deception detection research (MacGiolla et al., 2017), this study required participants to make sketches of the intended/experienced and imagined past and future scenarios.

Drawings have made sporadic appearances as dependent variables in a range of contexts over the years. Reality monitoring theory was developed in line with differences in seen vs. imagined drawings (Johnson, Raye, Foley & Kim, 1982). Drawings have long been used in projective tests or

for exploratory studies. For example, Aaronson (1966) reports a series of experiments using hypnosis to induce belief that there was *no past*, *no present* or *no future* or that the past or future had been expanded. Some examples of drawings made in these hypnotic states are reproduced in Appendix K. As this example shows, drawings have a mixed history, with dubious benefit in projective tests but can be useful as a means to capture information that is difficult to articulate or when interviewing children (Imuta, Scarf, Pharo & Hayne, 2013). Encoding information that is depicted in drawings leads to superior recall in comparison to encoding by reading or visualising to-be-learned material and this effect can be replicated in mass testing, for example in university lecture halls (Wammes, Meade & Fernandes, 2016). Drawing can reduce mind wandering: doodling while on the phone leads to enhanced recall for spoken information (Andrade, 2009). Drawing while being interviewed has been shown to lead to more information from honest participants in interpreter-based interviews (Vrij et al., 2017) and more inconsistencies in liars (Leins, Fisher & Vrij, 2012). The use of drawings as dependent variables opens up the possibility of an objective measure of self-rated visual perspective, which is often examined in the context of mental time travel (McDermott et al., 2015; Rice & Rubin, 2011).

A specific function of episodic future thinking is posited to be spatial navigation, (Schacter et al., 2017). The use of drawings in such research could be a novel way to capture differences between future thinking for scenes (*e.g.* a beach) vs. whole scenarios (*e.g.* a family meal) and for imagery ability, distinctions that has been highlighted in recent research (Sheldon & El Asmar, 2018). Asking participants to make drawings is quick, involves minimal contamination through interviewing style, overcomes variance in language fluency, can be used where language proficiency may be an issue and enables access to a participant's perspective that is not shaped by his or her capacity to express their thoughts.

Drawings have been used as a means to distinguish real from fictious events in psycho-legal research (MacGiolla, Granhag & Vernham, 2017). In these studies, the gap between experience and imagination is anticipated to uncover differences between drawings of real and lied-about destinations. Spatial layout, the presence or absence of incidental figures within the composition, the level of detail of sketches and of incidental figures (bystanders) within the sketches have been evaluated alongside more general appraisals of how plausible the image is, where plausibility is defined as being able to imagine the person in the drawing really standing there (Vrij et al., 2010; Vrij et al., 2012, Mac Giolla et al., 2017). Vrij et al. (2012) found that real events were more likely to be drawn with bystanders present and from a visual perspective over the shoulder (as opposed to from above, like a map).

The extent to which these findings generalise to future events has not been established. The extent to which these findings vary by belief that an event will occur in the recent past or future has not been investigated. In study 4, participants were asked to simulate events that varied by belief in occurrence (believed, fictitious) set two weeks around the present. Testing was carried out in small groups. Participants closed their eyes and wore earplugs while imagining each event. After each simulation, participants made drawings of the events they had simulated. These drawings were presented for rating by age-matched judges on the basis of plausibility, detail and visual perspective. Two new judges rated the drawings for bystanders. In the first part of the study, event cues were validated.

6.2 Study 4(a)

Introduction

Study 4 was designed to investigate prospection and memory at a distance of two weeks around the present with a sample of sixth form pupils who were attending a University taster day. Participants were 16-18 year olds. At the time of data collection, teenagers were obliged by law to attend school or training until the age of 18 (Department of Education, 2013). As such, it was anticipated that the majority of study 4(b) participants would be living at home, where daily activities would be subject to age-specific constraints such as school commitments, parental consent, budgetary restriction and for many, not being of age to visit clubs and bars. Studies 1(a, b), and 4(a, b) were conducted with 18-30 year old students and staff at UK universities and stimuli. It seemed unlikely that the event stimuli used in these studies could be assumed to be salient to a younger cohort. A pilot study 4(a) was designed to generate a list of 10 events to be used as stimuli in study 4(b).

The aim of study 4(a) was to generate a range of events that would be personally plausible, similarly frequently experienced, and easy to picture in the mind's eye for a 16-18 year old cohort. To be fit for purpose, items needed to constitute a range from which each participant could select both salient and not-salient events. Two events would be set in the past weeks immediately preceding testing. Two events would be set in the two weeks immediately following testing. Thus the event list needed to yield a range that would make it possible to select something genuinely experienced (past) and a second item truly anticipated (future). Two further items would be selected on the basis that while both were personally plausible, one had not been experienced in the previous two weeks and the other was not anticipated to take place in the next two weeks. Thus the most frequently experienced events for this cohort may not be suitable as these would not be options for the not-salient conditions. The aim was to identify a list of ten events that were controlled to be similarly frequently

experienced, personally plausible and easy to picture in the mind's eye for 16-18 year old participants.

Method

Participants

Sixty five prospective university students aged 16–18 were recruited through personal contacts and via Facebook. After exclusions (see Results section), the final sample consisted of 33 native English speakers (22 females, one person selected gender as *Other*) with a mean age of aged 16.58 (*SD* = .79).

Materials and procedure

An online questionnaire was presented on Survey Gizmo software (www.surveygizmo.com). The study was presented in two parts. Phase 1 was used to obtain plausibility, frequency and imageability ratings for 14 events based on stimuli obtained in earlier pilot studies presented in this thesis: 1(a) and 4(a). Four additional items were generated through discussion with personal contacts, who were parents of 16-18 year olds. Phase 2 of the questionnaire asked for 5 examples of events that were frequently experienced in every day life by each participant.

The first screen of the questionnaire was an information sheet explaining that the study was designed to gather information about everyday events that are relevant to 16–18 year olds in the UK. Survey settings prevented participants located outside the UK to proceed beyond the first page.

After answering questions on age, gender, educational attainment and plans to go to university, 14 events were presented for rating. Instructions stated:

> *You will now be presented with a series of everyday events. We want you to think about whether or not these are things you are*

likely to do in any two-week period. Think about what you did in the previous two weeks and what you know you will be doing in the next two weeks to answer these questions.

Responses were made on a Likert scale from 1 (*Definitely disagree) to 7 (Definitely agree*). For each event, three questions were answered: *It is plausible (not impossible) that I would do this in any two-week period, I frequently do this activity within any two-week period* and, *If I close my eyes I can easily generate a mental image of myself doing this.* A reminder of the experimental instructions was presented after each block of six questions.

Following the rating task, participants gave five examples of salient events from their own lives. Instructions stated:

These should be things you have done over the last two weeks and things you plan to do in the next two weeks.

Examples of appropriate events were given: *Go to a tutor session, play a specific sport, band practice, play rehearsal, make a vlog post.*

6.3 Study 4(a) Results and Discussion

Data were excluded where the questionnaire had been partially completed (N = 21) or information was missing in respect to age, intention to go to university, or speaking English as a first language (N = 11).

Event rating. A global score each of the 14 events presented for rating in the first phase of the study was created from mean scores for plausibility, frequency and imageability for each item. Eight participants were missing data for at least one cell of the rating task. Excluding these participants would reduce the sample to 25, so means were based on samples ranging in size from 29-33. A table showing sample sizes, ratings for plausibility, frequency and ease of imagery, mean

scores and Cronbach's Alphas is presented in Appendix L1.

New events. The second phase of the questionnaire collected examples of new every day events. An overview of the events suggested by theme and suitability for use as salient and not salient cues is presented in Appendix L2. Several items matched events presented in Phase 1: *Stay in with a friend/partner/family member and share pizza and a movie* (5), *Volunteer* (4), *Meal out* (3), *Meet friend for hot drink* (3), *Shopping* (3), *Cinema* (2), *New recipe* (2), *Friend's House film* (1). After eliminating these items, 154 new events were sorted into event themes (*study and practice*; *home and leisure; creative*; *specific;* and *fitness*) and then considered on the basis of suitability for use as both salient and not salient past and future stimuli in study 4(b). Each item needed to be suitable for use in all four experimental trials. This made some events unsuitable. For example, the category receiving most nominations was *study and practice*, which consisted of school lessons, revision and exam practice (n = 42). The ubiquity of this exemplar would make it unlikely to be selected as a not-experienced or unanticipated event in the main experiment. Items collated under the category *home and leisure* included events that could be generated in response to cues already rated in Phase 1. For example *socialising with friends/partner* could be generated by several of the cues in Table 5.1. Items categorized as *creative* and *specific* were low in frequency (n mentions) and some were highly specific. For either of these reasons, such events would be unlikely to be generalizable as salient cues, e.g. *maintain motorcycle*. For both of these broader groups, further piloting would be required to establish validity for frequency, plausibility and ease of mental imagery. The decision was taken to reject items falling into these categories for use as cues in study 4(b). A third category emerged from the new events data that suggested that the exemplar that had been rated did not capture the interest in fitness within the cohort.

Participants mentioned physical exercise frequently in Phase 2. A range of events were nominated: rugby, swimming, football, dance, gym, running, badminton, basketball, circuits, exercise, fencing, netball, skating, tennis, trampolining and yoga were mentioned at least once. Many of these forms of sport or fitness were not captured by the phrasing of the item *work out in a gym or at a fitness class* that had been rated in the earlier phase of the study. The decision was taken to reword this event cue to a broader definition: *do some fitness or exercise*. Thus the final list of event stimuli used in study 4(b) comprised nine items that received the highest global scores for frequency, plausibility and ease of imagery in Phase 1 and a fitness item rephrased as *do some fitness or exercise*. The list of stimuli used in study 4(b) is presented in Table 5.1:

Table 6.1

Study 4(a) Event Scenario Ratings for Study 4(b) Stimuli

		Rating				
Event	***n***	***Plausible***	***Frequent***	***Image***	***Global***	α
Stay in with a friend, partner or family member and share pizza and a movie	31	5.81	4.68	6	5.5	.76
Go on a shopping trip to buy a specific item (e.g. clothes, shoes, equipment)	33	5.64	4.79	5.76	5.4	.88
Meet up with a friend for coffee/ hot chocolate	32	5.19	4.09	5.44	4.91	.89
Friend's house to watch a film	33	5.3	3.85	5.33	4.83	.81
Go to the cinema	33	4.94	3.39	5.27	4.53	.78
Go out for a meal	33	4.79	3.45	5.3	4.51	.74
Do some voluntary work (e.g. work experience, giving up time without being paid)	32	4.53	3.34	4.97	4.28	.87
Attend a party or some sort of celebration	29	4.79	3.31	4.52	4.21	.85
Make a new recipe that you have never cooked before	32	4.28	3.38	4.78	4.15	.91
Work out in a gym or at a fitness class *	31	4.1	3.23	4.03	3.79	.87

Note * 31 nominations for other types of fitness were made in Phase 2. Thus this item was reworded to *Do some fitness or exercise* when used as a cue in Study 4(b)

6.4 Study 4 (b)

Method

Design and Participants

Study 4 was a behavioural experiment in which subjects were asked to imagine, describe and then draw four specific events: two set in the past, two set in the future, all at a distance of within two weeks. The study employed a 2 (intended/experienced, not intended/not experienced) by 2 (past, future) within participants design. Participants were 90 sixth form students (11 males, 6 did not supply gender information) who were attending a taster day held in the Department of Psychology at Royal Holloway, University of London. The mean age was 16.94, *SD* = 1.37. All participants gave informed consent to take part in the study and the study received approval by the Ethics Committee at Royal Holloway, University of London.

Materials and procedure

Participants were attending one of two undergraduate taster days held in the Department of Psychology at Royal Holloway, University of London. A number of psychology studies were conducted over the course of each day and participation was open to school visitors as part of an opportunity to try out the university experience. Participants chose to sign up for a *Travelling in Time Study*, which was advertised in posters and leaflets given to those attending on the day. Data collection was carried out in one lecture theatre with multiple sessions over three dates. The number tested in each session varied, range: 3–30 participants. Stimuli were adapted from previous studies (Study 1b; Lehner & D'Argembeau, 2016, Vrij et al., 2010).

Instructions were presented in PowerPoint software on a whiteboard. Alternate chairs were removed from desks so that participants were separated by the space of one empty seat. Each workspace was equipped with a consent form, an A4 sized booklet, black biro pen and a pair of Howard Leight Laser Lite Earplugs in sealed packaging. Two sets of booklets were created in order to counterbalance the temporal order in which events were presented (future first, past first).

On entering the lecture theatre, instructions were given to switch off mobile telephones, work in silence but to raise a hand if help was required. The experiment began with slides clarifying the terms episodic memory, episodic future thinking, and the distinctions between episodic and semantic remembering and prospection. Further salience to the slides came from an example of episodic future thinking, which was given in the form of the question:

Will you want to go clubbing on your 40th birthday?

The example for semantic future thinking was:

Will Egham have a Disneyland in 2050?

After clarifying the episodic nature of recollection and prospection under investigation, participants were told that they should constrain events thought of in the experiment to a two-week time frame around the present moment.

To ensure that only one event was selected for each experimental trial, an overview of the procedure for choosing events preceded the event selection process. The overview was depicted in a table displayed on the whiteboard, with the list of of ten possible event stimuli generated in study 4(a) displayed in the first column. The second column displayed the four experimental conditions, which were described as:

Past true (something that happened in the last two weeks)

Past made up (something that did not happen in the last two weeks)
Future true (something in your diary to happen in the next two weeks)
Future made up (something that will not happen to you in the next two weeks)

Participants were told they would be asked to choose four events, one for each condition, on the basis that each event was clearly distinguishable as belonging exclusively to the category for which it had been selected. A suitable event would also be specific: *i.e.* a one time event that lasted (or would last) over one hour and under one day.

After the overview of the task, participants were taken through the decision process again, one trial at a time, one screen per trial. For each of the 4 event selection decisions, participants saw the same list at the top of the screen with the selection criteria pertaining to the condition displayed at the bottom of the screen. Instructions for the true past condition were:

Choose an event from this list that is something you have done in the last two weeks. When you have chosen the event, write it in the box at the top of page 3 of your booklet then close the booklet.

The invented past instructions were:

Choose another event from this list but this one should be something you have NOT done in the last two weeks. Ideally for even longer. When you have chosen the event, write it in the box at the top of page 7 of your booklet. When you have chosen the event, write it in the box at the top of page 3...

The true future instructions were:

Choose a third event from the list: something you plan to do in the next two weeks. It should be in your calendar or diary or you have

already arranged this with someone. When you have chosen the event, write it in the box at the top of page 11…

The invented future instructions were:

Choose a different event from this list. This time it should be something that you have no plans to do in the next two weeks and ideally for even longer. When you have chosen the event, write it in the box at the top of page 15…

Half of participants received these instructions with the future conditions presented first. After 4 events had been selected and written into the booklet on the corresponding pages, the experimental trials began. Participants were instructed to check the event stimulus at the start of each experimental trial. For example:

Turn to page 3 in your booklet. Remind yourself which event stimulus you have chosen for the true past event (written in the box at the top of the page). Close your booklet again.

Participants were reminded to listen carefully to the verbal instructions (which were shown on the whiteboard as well as read out loud), to be ready to insert earplugs and to commence the simulation phase on hearing the word *go*.

For true and imagined past trials, instructions were:

You are being asked to think about a past event.
I would like you to travel back in time to remember or simulate a specific occasion that matches this description and lasted over an hour and under one day within the past two weeks.
When I say "go" I want you to close your eyes and try to experience the event in your mind. Notice the setting, the way things happened, any people and objects present, any sensory details. Try to explore what it is like to be there in as much detail as you can.

The simulation instructions for true and imagined future events stated:

> *You are being asked to think about a future event. I would like you to project yourself forward in time and imagine a specific occasion that matches this description and will last over an hour and under one day in the next two weeks.*
>
> *When I say "go" I want you to close your eyes and try to experience the event in your mind. Notice the setting, the way things happen, people and objects present, any sensory details. Try to explore what it feels like to be there in as much detail as you can.*

For all trials the instructions ended with the words:

> *You have one minute. I will tell you when to stop. Now put the earplugs in, close your eyes, go!*

After one minute, participants were given verbal instructions to open their eyes, remove the earplugs and turn to a specific page in the booklet. For each trial a drawing was then made in response to the instructions:

> *Using the black pen provided, please make a detailed drawing of the event that you imagined on page X of your booklet. You have three minutes.*

After 3 minutes had elapsed, participants were told to open a specific page in the booklet (the page number determined by the experimental condition). Written instructions directed participants to answer questions about the qualities of the simulation they had just carried out.

> *Thinking about the simulation you just did about a recent [past] [future] event, please complete questions 1–8.*

The first question asked for a brief description of the content of the simulation in 2–3 sentences. Seven questions related to subjective

feelings and event features, which were rated on 7-point Likert scales from 1 (*not at all*), to 7 (*completely*).

Two questions related to the sense of autonoesis or mental time travel:

While imagining the event, I feel as though I am really there experiencing it

While imagining the event, I had the impression of going into the past and finding myself at the time that the event was occurring

Two questions centred on location:

My representation for the location where the event takes place is clear

The relative spatial arrangement of people and objects in my representation for the event is clear

One question centred on visual details:

My representation for this event involves visual details

One question related to event novelty, measured on a scale from 1 (*never*), to 7 (*very often*):

I have already experienced the same or a similar event

One question operated as a manipulation check and asked for ratings on belief in occurrence, which was indicated on a scale from 1 (100% fantasy) to 7 (100% real).

For past events, the question was worded:

The event that I simulated really took place in the past two weeks

For future events the question was

Right now, I believe that the event I simulated will really take place in the next two weeks

After each of the first three experimental trials, participants were presented with a one-minute distractor task. Two were anagram-solving puzzles, one was a backward counting task. Answers to the tasks were written into the booklet on specific pages for each trial. After all four trials had been completed; participants were thanked, debriefed and dismissed.

6.5 Results

Simulation descriptions were used to verify that event cue chosen for each trial was taken from the list of ten events presented as stimuli. Simulation descriptions were also used to check that drawing content appeared to match the stated cue. These checks showed that 6 participants had not followed experimental instructions. Three had not completed the phenomenological qualities for all four trials, one appeared to have transposed drawings between conditions and two had used self-chosen (non-experimental) cues for all 4 trials. Data from these participants were excluded from the final analyses, which were based on 84 participants.

Data were analysed using linear and nonlinear mixed effects models (nlme) in R (Pinheiro, Bates, DebRoy, Sarkar & R Core Team, 2017). The method for the analyses is described in the results section of study 1(b) (Wright, 2008; Wright & London, 2009). Means, standard deviations, main effects and interactions are presented in Table 6.2.

Manipulation check

Participants rated the extent to which each event was believed likely to have occurred (past) or to be going to occur (future). This measure was effectively a manipulation check and showed that the events varied on the basis of belief that they had or would occur. Analyses revealed main effects of time and also of belief and these were qualified by an interaction. Post hoc analyses showed that believed past events were more believed to have occurred (M = 6.83, SD .64) than fictitious events

set in the past (*M* = 1.48, *SD* = 1.28), $\chi^2(1, n = 84) = 350.01$, $p < .0001$, $R^2 = .88$. This pattern was also true for future events, believed (*M* = 5.96, *SD* = 1.17) vs. fictitious (*M* = 1.68, *SD* = 1.11), $\chi^2(1, n = 84) = 255.81$, $p < .0001$, $R^2 = .78$. There was no difference between fictitious events set in the past or future ($p = .27$) but believed events in the past were more believed than believed events in the future, $\chi^2(1, n = 84) = 36.27$, $p < .0001$, $R^2 = .18$. Fictitious events were rated as more novel compared to experienced and anticipated events. There was a main effect of temporal direction showing that future events were more novel than past, with no interaction between these main effects.

Phenomenological measures

Results of the phenomenological analyses showed significant main effects of belief on the phenomenology of simulations. Results of autonoetic analyses showed that believed events in the past and future were experienced with a greater sense of mental time travel and p/re-experiencing. There were also a main effect of time on pre-experiencing and a small but significant interaction. Planned comparisons showed that the sense of p/re-experiencing fictitious past and future events was similar, $\chi^2(1, n = 84) = .39$, $p = .53$, $R^2 = .0$ but believed past events (M = 5.12, SD = 1.64) resulted in a greater sense of re-experiencing compared to believed future events (M = 4.42, SD = 1.50), $\chi^2(1, n = 84) = 11.61$, $p < .0007$, $R^2 = .05$. The impact of belief and temporal direction on the two measures of autonoesis can be seen in figures 6.1 and 6.2. Spatial and visual measures showed main effects of time and smaller effects of temporal direction. Believed events received higher ratings for location, spatial location of people and objects and visual detail compared to fictitious events and these were more pronounced for experienced compared to anticipated events.

Table 6.2

Study 4(b) Descriptive and MLM Statistics for Phenomenological Characteristics of MTT as a Function of Belief and Time

	Past				*Future*				*Main effects and Interaction*				
	Believed		*Fictitious*		*Believed*		*Fictitious*		*B vs. F*		*F vs. P*		*Interact.*
Measure	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	χ^2	R^2	χ^2	R^2	χ^2
Autonoetic	5.15	(1.59)	3.52	(1.48)	4.66	(1.25)	3.49	(1.66)	85.55***	.18	2.63	0	2.80
P/Re-experiencing	5.21	(1.64)	3.70	(1.53)	4.42	(1.5)	3.57	(1.76)	50.70***	.11	6.31**	.01	3.72*
Mental time travel	5.18	(1.74)	3.35	(1.73)	4.89	(1.44)	3.41	(1.79)	90.37***	.2	.35	0	1.18
Location	6.06	(1.19)	4.89	(1.76)	5.35	(1.72)	4.79	(1.88)	24.99***	.06	5.45*	.01	3.35
Spatial people/objects	5.45	(1.38)	4.51	(1.96)	4.82	(1.79)	4.26	(1.92)	18.33***	.04	6.17**	.02	1.26
Visual detail	5.86	(1.18)	4.89	(1.65)	5.58	(1.48)	4.57	(1.85)	49.31***	.09	4.1*	.01	.03
Event Novelty	5.89	(1.55)	4.31	(1.96)	5.58	(1.45)	3.63	(2.01)	81.28***	.2	5.49*	.02	1.08
Likelihood (belief)	6.83	(.64)	1.49	(1.29)	5.96	(1.17)	1.68	(1.11)	581.69**	.82	1.38	0	19.93***

Note: * $p \leq .05$ ** $p \leq .01$ *** $p \leq .0001$ for all χ^2 *statistics,* $df = 1$, $n = 336$

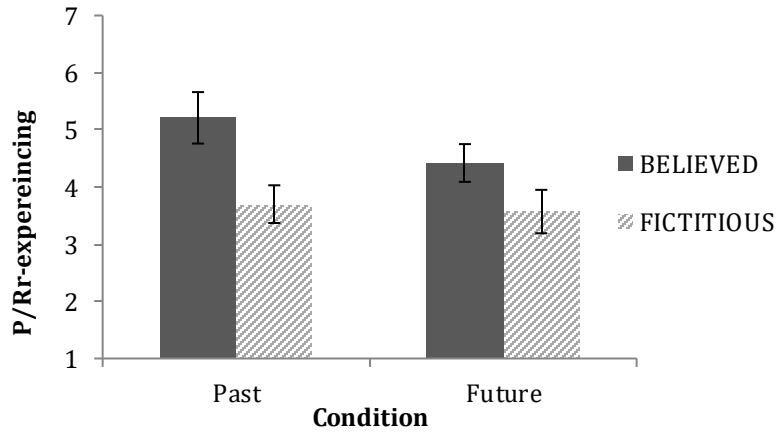

Figure 6.1. P/re-experiencing by time and salience

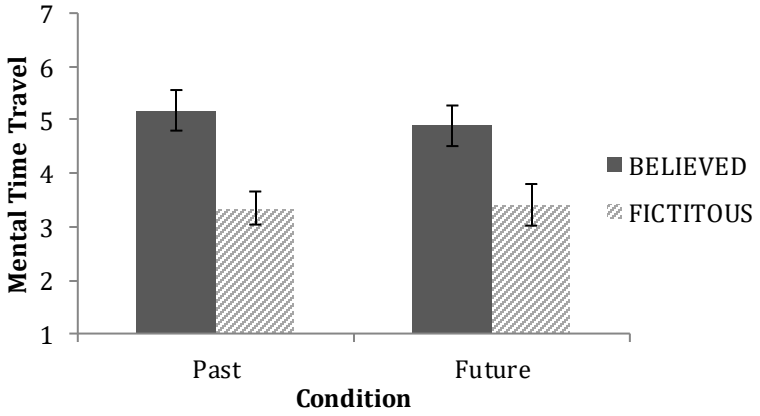

Figure 6.2. Mental time travel by time and salience

Discussion

Results indicated that the manipulation was successful. Fictitious events were validated as significantly more novel and less believed to have occurred or to be going to occur. Phenomenological measures indicated that participants subjectively experienced their simulations of events with a stronger sense of visual and spatial components as indexed by self-ratings. Drawings were presented for rating by judges in the next phase of the study.

6.6 Study 4(c)

Introduction

A study was designed to look at the content of drawings from study 4(b) and obtain judgements for variables taken from previous research in the detection of deception in drawing and sketches: plausibility, detail, visual perspective, presence of bystanders, detail of bystanders (Mac Giolla et al., 2017; Vrij et al., 2012). Examples of drawings that were examined can be seen in Appendix M.

Method

Participants

Plausibility, detail and visual perspective judgements were carried out by two A Level Psychology students. Both were females aged 17 who attended different schools in London and were not known to each other. This meant that the judges were of similar age to drawings senders. Participants were tested individually and did not meet in the course of carrying out the rating task. Bystander coding was carried out by two female undergraduates aged 18 and 20, who were studying psychology at different UK universities and were recruited through personal contacts. It was anticipated that some experience of psychological research methods would be useful should the task require agreement through discussion. All judges and coders were blind to the experimental design and hypotheses of both studies 4(b) and 4(c).

Materials and procedure

Five sets of drawings made by participants who had failed to follow the experimental procedure in study 4(b) were excluded from all ratings task. Plausibility, detail, visual perspective, bystander presence and detail ratings were carried out on 340 drawings.

Plausibility, Detail and Visual perspective. Two questionnaires were created on Qualtrics software. In order to limit fatigue or other extraneous effect of making numerous consecutive judgements, judges rated the sketches in two sessions held one week apart. The first questionnaire contained 168 jpegs of drawings from study 4(b), the second questionnaire contained the remaining 172 jpegs of drawings from study 4(b). The design and instructional text were identical in both questionnaires but the order in which the stimuli were presented for each participant was randomised. Participants were tested individually in a quiet room, working on a Macbook Air 11" laptop. Time to view was not constrained but both participants completed the rating task for each questionnaire in 90 minutes.

Both questionnaires were accessed through pages in which a unique password was submitted. A numeric identity code, age and gender information were entered on the first screen. The next screen presented general instructions for the rating task, which stated:

> *You are going to be shown a series of drawings where the sender (the person who made the drawing) has sketched a scene of him or herself that matches the caption above each drawing.*
>
> *Please look carefully at each drawing and then answer the questions that follow it.*
>
> *You must answer each question in order to proceed through the questionnaire. You will not be able to go back and change your answers to previous questions.*

Each page of the survey was titled with an event caption: the cue chosen by the person who had made the drawing who had made the drawing in the main experiment study 4(b). Drawing creators will be referred to as

senders hereafter. Drawings were presented so that the proportion of drawing to blank page was clear. The page could be scrolled or enlarged as required. Judgements were indicated directly below each drawing. Two questions were presented in a matrix table: *How detailed is the drawing?* and *Plausibility: I can imagine the sender being in this place.* Responses to each question were made on a Likert scale from 1 (not at all) to 7 (completely). The third question text was framed as a binary choice: *Viewpoint: the picture is drawn as if I am looking at the scene…* Participants responded by selecting: *over the shoulder* or *from above*.

Bystander Rating. Two questionnaires were created in Qualtrics software. The presentation of drawings followed the method that was used to obtain plausibility, detail and visual perspective ratings, described in the previous section. After each caption and drawing, judges recorded the number of people other than the drawing sender that could be seen in the picture. A slider was used to indicate the level of detail in which any bystanders were depicted on a Likert scale from 1 (*low*) to 7 (*high*). Since the instructions in study 4(b) had been to draw autobiographical events, real or imagined, set in the past or future, a single figure in each drawing was assumed to depict the sender. Drawings containing more than one figure were coded as *bystanders present*. Figures within television or cinema screens or in paintings on a wall were not counted as bystanders. Animals were not counted as bystanders. Where bystanders were present, the level of detail in which bystander figures were drawn was rated on a Likert scale from 1 (*very low)* to 7 (*very high*).

6.7 Results and Discussion

Plausibility, detail and viewpoint

Judges' ratings for plausibility, detail and viewpoint were examined for reliability. Intra-class correlation between the judges did not reach acceptable levels for plausibility (r = .54.) or the level of detail in each drawing (r = .58). Correlations within and between raters are presented in Table X. The strongest correlation found was between Rater 2 detail and Rater 2 plausibility, r =.78, suggesting that there may have been some overlap in these judgements.

Table 6.3

Study 4(c) Correlations Between Plausibility and Detail

	Rater 2 Plausibility	*Rater 1 Detail*	*Rater 2 Detail*
Rater 1 Plausibility	.42**	.78**	.45**
Rater 2 Plausibility	–	.35**	.62**
Rater 1 Detail		–	.42**

** Correlation is significant at the 0.01 level (2-tailed).

Data were categorical and Cohen's Kappa was used to assess inter-rater reliability for visual perspective (*over the shoulder*, *from above*). Judges' agreement was not sufficient for further analyses (Kappa = 0.61). Since none of these variables proved to be sufficiently reliable, no further analyses on plausibility, detail or visual perspective between drawings of past and future, salient and not salient events were carried out.

Bystander Ratings

Raters initially agreed on the presence or absence of bystanders in all but 12 drawings. After further discussion, complete agreement was reached.

Bystanders were present in 253 drawings and absent from 87 drawings. Table 6.4 shows the frequency with which bystanders were absent or present by study 2(b) experimental conditions (time, belief in occurrence). Chi-square tests of independence there were no differences in the number of bystanders depicted in drawings by belief, whether these were set in the past, $\chi^2(1) = 1.79$, $p = .18$ or the future, $\chi^2(1) = 2.60$, $p = .11$. The intra class correlation coefficient for bystander detail was .54. Since judges' agreement was only moderate, no further analyses were carried out on the level of detail in which bystanders had been depicted.

Table 6.4

Study 4(c) Bystanders by Condition

	Bystander Absent			*Bystander Present*		
	Past	*Future*	*Total*	*Past*	*Future*	*Total*
Believed	23	26	49	62	59	121
Not believed	18	20	38	67	65	132

Discussion

Study 4(c) was conducted to obtain ratings on 340 drawings depicting believed and imagined events from the recent past and near future. Self-ratings made by drawing senders in study 4(b) indicated that the location, spatial layout of people and objects and visual detail of believed events had been subjectively experienced as more vivid compared to fictitious events. These self-ratings were higher for past compared to future events but believed and fictitious events had the largest effect. In study 4(c) two judges assessed the drawings for plausibility, detail and the visual perspective from which the events were drawn. The number of bystanders and the level of detail in which bystanders were depicted. In contrast to previous research showing fewer bystanders in not-experienced (and deliberately deceptive) sketches, there was no difference in the number of bystanders in experienced or anticipated compared to fictitious drawings (Vrij, Leal et al, 2010).

As regards the first set of ratings, the poor reliability of age-matched judges' ratings for the plausibility of the drawings (.54), the level of detail in which they were drawn (.58) and the visual perspective (.61) prevented further analyses of the extent to which these ratings varied by temporal direction and belief in occurrence. Judges were not trained in what might constitute plausibility but responded to a question posed in previous research which was *I can image the sender being in this place* (Vrij, Leal et al., 2010). Training and feedback on this measure would be difficult to achieve without inadvertently leading judges to rate an ill-defined construct. An exploratory study with multiple age-matched raters would be an interesting avenue for further research. Calderon et al. (2018) recently reported a study in which 117 raters were recruited via Amazon's Mechanical Turk. Raters received training as part of the study then viewed and rated 57 drawings by answering a single question about the construal level of the scenes depicted. Reliability was excellent (r = .94). As an

exploratory study, this method might be used to collect further ratings from an age-matched sample to see if a larger data set leads to a clearer pattern of agreement on what constitutes plausibility in these drawings. It is worth noting that reliability of the plausibility measure in the study reported by Vrij, Leal et al. (2010, p. 590) was .48. The authors support the use of the scale by stating that reliability scores of .4–.6 are not unusual when lie detection coding is conducted on verbal data.

The reliability of raters' assessments of detail was similarly low, which was more surprising given that the level of detail in which drawings are made is a less abstract, more concrete judgement that has been reported to have good reliability in previous research (Vrij, Leal et al., 2010; Vrij et al., 2012). Similarly, the question of viewpoint (over the shoulder, from above) was not agreed on in these drawings. This may be related to the events being depicted. In previous research in which these judgements have been made, drawings were of mock crime scenes. For example, Vrij, Leal and colleagues gave an instruction to draw the scene where participants had earlier received a package from another agent (2010). The authors' state that drawing senders only have two options for visual perspective: over the shoulder or from above. Recent research on visual perspective of simulating scenarios – seeing in the mind's eye – suggest that multiple perspectives emerge when a range of events are presented (McDermott et al., 2016; Rice & Rubin, 2011).

The level of detail in which bystanders were depicted in drawings was assessed by two new judges. These ratings also showed low reliability and were not analysed further. The number of bystanders in drawings did not differ. One limitation of this measure is highlighted by comments made by judges on the instructions they received, which explained how the sender should be identified within each image but gave judges less guidance on how to restrict detail ratings exclusively to bystanders. After rating the drawings, judges comments suggest that both raters included

sender figures in the overall bystander rating, at least some of the time. Judge 1 explained the processes used to identify and exclude the sender in the rating task. On the basis of Judge 2's comments this rater may have included the sender figure in most ratings.

> Judge 1: *Sometimes it was obvious who the sender and who the bystanders were. For example, some included labels saying who each person was and others had the sender completing the specific action (so the others I presumed were bystanders). In this case I only rated who I thought were bystanders for detail. In other pictures it was not so clear who was the sender and who were the bystanders (for example they were all doing the same action). In this case I just took into account every person in the drawing in the detail rating.*
>
> Judge 2*: I usually thought the person with the most detail, the biggest figure or the figure at the centre of the page was the sender. The figure with the most detail I viewed as the most important, then the size of the figures next and the last thing that helped me was the positioning of them on the page. I did try to include all the figures when making a detail rating, if there were two main detailed figures and others that were not detailed then this would even out as a 4 rating.*

The two judges came to agreement so that this finding is most likely reliable, however these comments highlight the importance of training and feedback between judges when rating made on the content of other people's drawings. These comments show that reliable ratings are not easily obtained and highlight possible limitations of their application. In deception detection contexts, such methods cannot yet be said to be reliable indicators of experience or anticipation.

Chapter 7
Study 5(a, b) On a Mission

7.1 General Introduction

The two studies in this chapter form a departure from the research presented in the rest of the thesis. In studies 1–4, future intention has been examined at a distance of two weeks, two months, and one year. In the experimental studies reported in Chapter 7, the future event that participants planned to undertake was considerably more imminent. The event was due to take place one hour ahead. In contrast to the previous experiments in this thesis, intention in study 5 was not veridical. In studies 1–4, experimental participants had a pre-existing belief that an event in the future was going to occur or was not likely to occur. In study 5(a) participants were randomly assigned to one of two conditions and given instructions to plan an activity that would be carried out within the hour. These instructions were intended to manipulate intention to carry out a future act. One group openly disclosed these plans while the other deliberately concealed their intentions from the experimenter. In contrast to studies 1–4, which examined true intention vs. no intention, the comparison in study 5 was true intention vs. fictitious intention. By examining the extent to which measures known to vary in episodic future thinking differ between these groups, a contribution is also made to understanding how future thinking varies on the basis of belief in occurrence. The experimental group in study 5 did not believe that critical aspects of the event they were describing would really occur.

Study 5(a) extends recent psycho-legal research, which has investigated plans for truly-intended vs. not-intended future events using a mock crime, design known as the Gothenburg method (Granhag & Knieps, 2011). In study 5(a), participants described their plans in forward and reverse chronological order. A novel feature of the study was that dependent

variables were drawings, interviews and phenomenological ratings of future plans. In study 5(b) 3 judges viewed 72 drawings and made ratings on plausibility, detail, visual perspective, presence of bystanders and the presence or absence of a critical item within each sketch. Where judge's scores formed reliable scales, these variables were examined to see if they could be used to discriminate true from deceptive drawings. To my knowledge, this is the first study to have been carried out in which drawings of deceptive future activities have been obtained using the Gothenburg method and evaluated by judges for group differences in content and detail.

Introduction Study 5(a)

The majority of literature on the detection of deception has focused on past events (Vrij, 2008). In the last decade a novel avenue of research has emerged in response to increasing demand for methods by which credibility can be established when suspects are questioned about their future plans (Granhag, 2010). The primary focus of such research has been to investigate how people communicate truly-intended future events and whether there are discernible differences when communication is intended to mask true intentions, for example, if someone is using a cover story (Clemens et al., 2011; Granhag, 2010; Vrij, Leal, et al., 2011). While some approaches to strategic interviewing increase the amount of information that can be obtained from witnesses and suspects, overall reliability and discriminant function of any one method to detect deception has yet to be established (Vrij, 2015). Promising results from the first few deception detection experiments which examined lying about future events somewhat preceded theoretical understanding. While episodic future thinking is a separate psychological construct to prospective memory, both have been cited as potential sources for methods by which truthful and

deceptive statements about future events might be discriminable (Granhag & Knieps, 2011; Granhag & Mac Giolla, 2014).

In terms of temporal distance from the present, research on prospective memory often employs a design where the target of recall is an event due to be carried out later the same day. Psycho-legal research on deception detection also typically uses temporally-close designs for mock crime in which future intentions can be examined. Both the Gothenburg method and the Portsmouth method are examples where the intended activity is in the immediate future, usually within the hour. There is some evidence that deceptive accounts of future plans contain less evidence of good planning behaviour and fewer implementation intention-related utterances (Mac Giolla et al., 2013). Implementation intentions are *if/when-then* plans (Gollwitzer, 1993; 1999). Given that the Gothenburg method requires both experimental groups to make a plan that they intend to execute, arguably both groups would have reason to use implementation intentions for their plans. Furthermore in a mock crime experiment liars must plan both the mock crime (intended) and a cover story (not intended but planned and rehearsed). These concurrent demands require foresight to anticipate potential pitfalls, problem solving and evaluation to generate a plan that best accommodates every consideration both in achieving the mock crime and in denying the true intention if/when questioned. By comparison, a truth teller's task is to plan a single action and then follow that plan. On this basis it could be posited that liars more than truth tellers might be expected to use implementation intentions when planning a task. Besides this consideration, speech-related differences in how the planning phase was carried out may not be evident in the interview phase of the study depending on what liars choose to reveal and what they choose to conceal.

Intention in the deception detection context has been defined as an actor's mental state preceding a corresponding action (Malle, Moses & Baldwin,

2001). Granhag (2010) cites and extends this definition saying that intention goes beyond mere desires. Intentions have three distinct features: they are centred on the person's own actions, they contain strong commitment and they involve planning. This definition is difficult to apply to all types of intention, particularly if there is a delay between forming the intention and carrying out the activity when the intention becomes more akin to a prospective memory task, which may be forgotten or overwritten by more imminent demands. To give an example, recently I booked and paid for a fitness class a week in advance. On the day, something came up and I did not go. By booking the place, I had made a plan to take that course of action and demonstrated a financial commitment to do so but as the event came closer in time, I changed the plan in line with a change in my own priorities. Were I now to be interviewed and required to talk about the class I no longer intend to go to, I have a representation of the class that I could report on in detail because I had simulated that hypothetical experience when fine-tuning my plans. If on the other hand, I was asked to generate a cover story for a future action themed on something that had never been part of my future, for example, a theme that an experimenter instructed me to imagine and describe, it is plausible that my description of an experimenter-cued event would be less detailed, with less spatial, sensory or autonoetic information than the description I could give of a class that I had at one time planned to attend. The point here is that plans instigated by an experimenter may not be an analogue of real plans (Neroni, Gamboz, de Vito & Brandimonte, 2016). In the real world, if forced to give a deceptive account of future plans, it seems likely that many people would employ the strategy of embedding lies in otherwise true accounts of the future activity.

One technique that has received research attention as a means by which to make a liar's task harder is to ask people to describe an event in reverse chronological order. The individual starts where the story ends and describes what happened, one scene at a time, working backwards to

the start of the episode. This method is taken from the Cognitive Interview, a strategic interviewing protocol that has been shown to help witnesses remember more detail (Fisher & Geiselman, 1984; Memon, Meissner & Fraser, 2010). The extra cognitive load induced by this technique is thought to make the task particularly difficult when the event being recalled was never experienced (Vrij, Mann, Fisher, Leal, Milne & Bull, 2008; Vrij, Leal, Mann & Fisher, 2012). Chronological order has been examined in the context of the elaboration processes of mental time travel by asking participants to describe memories in forward and backward chronological order, using free recall or organised by order of interest (Anderson and Conway, 1993). Results showed that forward and free recall instructions led to faster recall and a second experiment showed that elaboration was shaped by a proportion of the story coming in one chunk followed by more details. When this design was extended with the addition of a future condition, production rates did not differ between past and future but when events were likely or not likely to occur, elaboration was faster in future trials (Anderson, Peters & Dewhurst, 2015). The extent to which the order of retrieval impacts on true vs. deceptive accounts of future events has received little attention with the exception of one recent study (Fenn et al., 2015), published after data collection in the present study in which being interviewed in reverse chronological order did not lead to group differences between liars and truth tellers.

Episodic future thinking has been used in psycho-legal research as a potential source of group difference when people are lying or teling the truth about future plans. In this context, participants are asked whether or not they formed a mental image of the scene during the planning phase and rate sensory and spatial aspects of the planning phase. On this basis, Granhag & Knieps (2011) tested and supported six hypotheses. Truth tellers (34 of 35) were more likely to have formed and activated a mental image during the planning phase compared to liars (23 of 35). This mental image was described in more words by truth tellers compared to liars. The

planning phase was more likely to have involved the forming of mental images in general among truth tellers and the sense of having pre-experienced the planning was greater for truth tellers. Truth tellers made higher ratings for the phenomenological experience of the planning phase. Liars perceived the question on whether they had formed a mental image during planning as more cognitively demanding to answer, which was explained by evidence that lying in general is more cognitively demanding than telling the truth (Vrij, Fisher, Mann & Leal, 2006).

When the Gothenburg method was extended with a second interview after a one-week delay (Knieps, Granhag & Vrij, 2013), results were more difficult to interpret. Truth tellers were more likely to report having formed a mental image in the second but not the first interview. The authors note that it is possible that differences in the qualities of the planning phase may have failed to reach significance in the first interview because 7 liars later claimed in a post-interview questionnaire that they had lied about having formed a mental image. In other words, some liars did not tell the truth when they were required to rate features of their planning. There were no differences on the self-reported phenomenology of the planning phase except for one variable; sense of location was greater for truth tellers compared to liars. Granhag & Knieps (2011) used an index of word count to show that truth tellers said more than liars when interviewed, but this result was not replicated by Knieps et al. (2013).

The familiarity of the location in which a future event will take place has been experimentally manipulated using the Gothenburg method (Knieps et al., 2014). Truth tellers planned a trip to a library to find out about a course; liars planned a mock crime to pass illicit material to a confederate and a cover story about visiting a library to find out about a course. Ratings for familiarity with the libraries were obtained in advance so that liars and truth tellers planned to visit familiar or unfamiliar libraries in a 2 x

2 between-group design. Both groups were given a photograph of a person who would be available to give task assistance in the library (truth tellers), or would be the secret agent to whom illicit material should be passed (liars). Thus both groups were primed to look out for a specific individual. Results showed that liars rated the task as more difficult and more stimulating than truth tellers when the location was familiar but not when it was unfamiliar. In this study, when asked explicitly, 93% of truth tellers and 69% of liars stated that they had formed a mental image during planning and a chi square analysis showed that this group difference was significant. However self-ratings on a question asking *How clearly did you pre-experience the future event/your cover story* showed no difference in episodic thinking between truth tellers and liars. Three other sensory variables differentiated the experimental groups: truth tellers experienced more *visual* and *olfactory* qualities during the planning phase. Liars were more aware of the *location of people/objects* during the planning phase. This was explained as evidence that liars planned to look out for the agent in the library more than truth tellers had planned to seek assistance with their task. These results suggest that forming a mental image during planning may denote differences between liars and truth tellers but does not index the autonoetic dimension of episodic future thinking.

As noted by one of the authors, one limitation of this particular strand of research is the limited ecological validity (Knieps, 2013 pp 28–29). Participants were supplied with a goal and constrained to attain this goal in a specific place and at a specific time. The processes of episodic future thinking may be rather different when an event draws upon veridical features of episodic future thinking, such as was found in studies 1, 4 and 5. One of the challenges of creating a reliable method by which intention might be detected in forensic contexts is the lack of evidence about how people naturally behave when they do or do not have the intention to carry out a particular task. This lack of grounding in existing psychological theory has been highlighted as a specific challenge to the detection of

deception (Granhag, 2010; Granhag & Mac Giolla, 2014). Some of the research presented in this thesis goes some way to answering this call.

Previous research has indicated that near future events are more likely to be imagined in familiar locations and that the familiarity of the location impacts on the clarity with which the location is imagined (Arnold, McDermott, Szpunar, 2011; Szpunar & McDermott, 2008). In studies 1, 3 and 4 of this thesis, participants selected the cues used to simulate mental time travel. One potential disadvantage of this was the lack of control over the location, which may have led to disparity in location familiarity between conditions. However previous research using the Gothenburg method in which familiarity with location was manipulated reported no group differences between truth tellers and liars for variables measuring episodic future thinking (Knieps et al., 2014). This may be due to the use of schematic representations, in this study the familiar and unfamiliar locations were libraries and although the occupation of participants is not stated in the method section, it seems likely that at least some were academics or students, so semantic information about what a library is like would have been available to them whether or not they were familiar with the precise location. Nevertheless, not being familiar with a location would make it difficult to form a mental image of that place. Thus it would be important to ensure that participants had similar levels of experience of the target location. In the present study, all participants were in their first three months of working or studying at the same university. Participants gave estimates of how frequently they had visited the location in the past. In this way it was possible to compare familiarity between groups as a manipulation check. Participants were also equipped with maps of the campus and of the shop to assist their planning.

In previous research using the Gothenburg method, participants were asked to report on the mental image they had formed during the planning phase (Granhag & Knieps, 2011, Knieps et al., 2013), or were strategically

interviewed (Sooniste et al., 2014; Warmelink et al., 2013) to reveal variance in the richness of planning representations between truth tellers and liars. Recent research has highlighted the distinction between thinking forward to a novel future event and recalling a memory of having previously thought forward to the future, or having a memory of the future (Ingvar, 1985; Jeunehomme & D'Argembeau, 2016; Szpunar, Addis, McLelland & Schacter, 2013). From the methods described in the studies cited, it is possible that participants were rating *memories of the future*. To attempt to better control this aspect of the design, in the present study 5(a) participants were intercepted en route to complete the task and took instruction from the letter they had been handed by the previous experimenter. The contents of the letter varied by experimental condition (*tell the truth*, *tell the cover story*). The overt instruction from the second interviewer was to report on the scenario that the participant anticipated would take place next. This instruction was anticipated to elicit sensory and phenomenological aspects of the anticipated future event rather than referring participants back to the planning phase of the study. Descriptions of truly intended scenarios set in the immediate future were hypothesised to receive higher ratings for subjective phenomenology, would be described in more words and would be depicted in drawings containing more detail. By contrast, liars might do their best to perform convincingly when delivering the cover story but the process of being interviewed about their plans and asked to describe these in forward chronological and reverse chronological order, making a drawing and rating the phenomenology of the future event could be hypothesised to be more demanding and might lead to lower ratings for subjective richness, less detailed drawings and shorter verbal descriptions of the planned activity. However, since future thinking was not being indexed by asking participants to think back to the planning phase, the extent to which episodic future thinking might be elicited in the present experiment was not clear.

Previous research has suggested that personality may be related to the capacity to project the self into the future to pre-experience events. For example, individuals inclined to greater openness to experiencing feelings rate the autonoetic component of prospection as more vivid (D'Argembeau & Van der Linden, 2006). Individuals who worry more tend to use an observer visual perspective when remembering (past) or imagining (future) autobiographical events (Finnbogadottir & Berntsen, 2014). There is some evidence that extraverts make better liars (Riggio, Salinas & Tucker, 1988). The Machiavellian liar is a caricature of a highly confident and manipulative individual who lies for instrumental reasons but the relationship between extraversion and deceptive traits in personality is not necessarily pathological (Vrij, 2008). Individuals who are socially adroit tend to be convincing liars (Kashy & DePaulo, 1996) and are more persistent when perpetrating a deception (Vrij and Holland, 1998). As a minor exploratory aside, participants completed a 46-item Big Five Inventory, the BFI-46-A (John, Donahue & Kentle, 1991, John, Nauman & Soto, 2008, Benet-Martinez & John, 1998).

7.2 Method

Design and Participants

The experiment was a between-group design in which half of participants were asked to plan a mock crime and to prepare a cover story to be used if they were asked about their intended activity, henceforth referred to as liars. Half of the participants planned a trip to the College shop to buy a gift, henceforth referred to as truth tellers. The dependent variables were scores on measures of autonoetic, sensory, spatial, emotional and narrative aspects of planning the activity and the number of words used to describe these plans.

Participants were 74 undergraduates or staff (18 males) recruited through the Department of Psychology experiment management system. The

experiment was advertised as a study about planning and actions in which participants would be asked to plan a trip from one building to another to carry out a specific task. Participants received course credits or a cash payment of £7. The study was approved by the internal ethics committee at Royal Holloway, University of London. The first consent form did not make mention that some participants would be required to conceal information from the experimenter. Thus after participating and receiving a full debrief, participants signed a second consent form indicating that the design and purpose of the study had been clearly explained and giving fully informed consent for their participation.

All participants indicated that they were fluent English language speakers. In line with previous research using this design, no age restrictions were imposed, the mean age was 19.31, (range 17–38). Familiarity with the component parts of an imagined future scenario (persons, location, objects) predicts the richness of a future simulation (McLelland, Devitt, Schacter & Addis, 2015). In order to control any advantages conferred by experience of the environment in which the planned activity would be carried out, all participants were in their first three months of study or work at the university. Data from two participants who did not follow the procedure were excluded from analyses, which were carried out on a sample of 72 participants. Participants were tested individually in two rooms in the same building in an annexe of the Department of Psychology at Royal Holloway, University of London.

Materials and Procedure

Planning phase. On arriving at the laboratory, participants were greeted by a research assistant, randomly assigned to experimental condition and signed the first consent form in which the study was described in the following way:

You will be asked to think about a specific scenario and plan how to undertake this scenario. You will then be asked to carry out the activity you planned.

This instruction was given as part of the experimental induction to ensure that participants believed they were making plans for an activity to be carried out in the next hour. However it is important to note that in reality, no participants went to the college shop. All participants were intercepted and interviewed before they left the building.

In the first phase of the study, participants completed a questionnaire by giving demographic information, reporting the number of weeks that they had been working or studying at the university, stating whether they had visited the college shop and giving an estimate of how many visits they made to the shop each week. Experience was measured on a scale from 1 (*Daily*), 2 (*2–3 times a week*), 3 (*Once a week*), 4 (*Once per month*), 5 (*Less than once a month*). There was only one shop on the university campus, thus all participants were thinking of the same location when answering these questions. Next participants completed the BFI-46-A (John et al., 1991; John et al., 2008; Benet-Martinez & John, 1998). Responses to 46 questions are made on a Likert scale from 1 (*disagree strongly*) to 5 (*agree strongly*). Mean scores for each dimension are used to create a profile of the big five personality factors: extraversion, agreeableness, conscientiousness, neuroticism and openness.

After completing the questionnaires, participants were taken through the instructions for the planning phase using a structured protocol read out by the first research assistant. Instructions clarified that there would be no practice phase and only one opportunity to carry out the task, which should be completed within 30 minutes of leaving the building. All participants were given a pen, a map of the college campus and a map of

the internal layout of the college shop (presented in Appendix N). Liars were told:

> *Today you are going on a mission to visit the college shop. First of all you need to carefully plan how you are going to carry this out. The mission is to leave this building and go directly to the college shop to put a memory stick on the Asian foods shelf. You must place it at the back of the bottom right shelf (on that aisle). You also need to plan a cover story to tell in case anyone asks what you are doing. Your cover story should be that you are in the shop to buy an item for yourself and a gift for someone else. The University has approved the experiment and we will give you a letter to show in the shop so they know that you are taking part in this study. You won't need to spend any money. To help you, you have a map of the campus and the map of the college shop to plan your route. You have 10 minutes to plan your mission. You don't have to tell me, just plan it in your head. While you are planning it is crucial to really pre-experience carrying out this activity. Notice the sights, smells and sounds you encounter both on the way and in the shop. Think about what you will see on your way there. Picture yourself walking around the shop. Think carefully about what you want to buy and imagine yourself carrying out the mission in detail.*

Truth tellers were told:

> *Today you are going on a mission to visit the college shop. First of all you need to carefully plan how you are going to carry this out. The mission is to buy an item for yourself and a gift for someone else. The University has approved the experiment and we will give you a letter to show in the shop so they know that you are taking part in this study. You won't need to spend any money. To help you, you have a map of the campus and the map of the college shop to plan your route. You have 10 minutes to plan your mission. You don't have to tell me, just plan it in your head. While you are*

planning it is crucial to really pre-experience carrying out this activity. Notice the sights, smells and sounds you encounter both on the way and in the shop. Think about what you will see on your way there. Picture yourself walking around the shop. Think carefully about what you want to buy and imagine yourself carrying out the mission in detail.

Immediately following the planning phase, a manipulation check was posed in the form of the question *what are you going to do now?* After confirming that the immediate destination was the college shop, each participant was given a letter in a sealed envelope which they understood should be handed over in lieu of money when at the till. Liars were also given a memory stick and told to conceal this in a bag or pocket in front of the research assistant, before leaving the room. All participants were thanked and told to report immediately to a second room in the same building, where there was a telephone and a second researcher waiting. Verbal instructions made it clear that each person should wait in the second room from where a call would be placed to the college shop to alert staff that the participant was due to leave.

Interception. Participants were intercepted by a second researcher (the author) before they had a chance to execute their planned actions. The second researcher was blind to experimental condition. On arrival in the second room, the participant was told to check the contents of the letter they had been given in the previous room. The sealed envelope contained instructions pertaining to the experimental condition. Participants who had planned the mock crime (liars) read instructions in which they were reminded to use their cover story to avoid detection; that is, to deceive the interviewer about their intentions. Instructions stated:

You have been intercepted. You will not be going to the College Shop. Instead you will now be interviewed about the mission you have just planned. Remember you must not reveal the true purpose

of your mission. You must use your cover story during the interview. You should report your plan as accurately as possible.

Participants who had planned a shopping trip to the college shop (truth tellers) were instructed to answer the interviewer's questions honestly:

You have been intercepted. You will not be going to the College Shop. Instead you will now be interviewed about the mission you have just planned. You should report your plan as accurately as possible.

Both groups were told to put the letter back into the envelope, then in a pocket or bag and not to show the contents to the researcher.

Interviews. All participants sat at a table and were interviewed individually by the second researcher, who followed a structured protocol. Interviews were audio recorded on a Sony digital voice recorder. Participants were asked to describe their intended plan in as much detail as possible, once in forward chronological order and a second time in reverse chronological order. The instructions were counterbalanced so that half of truth tellers and half of liars gave a forward chronological order account of their plans first. The instructions for the forward chronological statement were worded:

I want you to tell me everything you plan to do from leaving this building up to where you have made your selection in the college shop and you are at the till, with your letter, explaining that you don't need money because you are taking part in this experiment. Notice the sights, smells and sounds that you encounter while you are in the shop and on the way there. Report everything you planned in as much detail as possible.

The instructions for the reverse temporal order statement were worded:

We are going to try something that sometimes helps people remember in more detail. What I am going to ask you to do is to tell me what you will do in the shop in as much detail as possible but in

reverse order. Start where you are at the shelf choosing a gift for someone. What was the last thing you were going to do previous to that? What happened just before that? Start where you are at the shelf choosing a gift in the campus shop and end where you are leaving this room to go to the shop. Notice the sights, smells and sounds that you encounter while you are in the shop and on the way there. Please report everything in as much detail as possible

After describing the plan in forward chronological and reverse chronological order, participants answered fixed questions about what they had been going to buy in the shop: *Tell me all the reasons why you are going to visit the shop today; Who are you buying the gift for?; What is on the shelf immediately to the right of the shelf where you are choosing the gift?* Responses to the fixed questions were used to identify the specific items planned to be purchased, in cases where these had not been explicitly named in the free recall statements.

Immediately after the recorded interviews, participants were given a pen and a sheet of blank A4 paper and instructed that they had three minutes in which to make a drawing of themselves standing in the shop, looking at the shelf from which they were choosing a gift for a friend.

Finally participants rated the phenomenological characteristics of their simulation and answered questions about the planning task using a questionnaire adapted from previous research, as described in study 1(b) (see 3.3). Question text is presented in Table 7.1. Since the experiment had involved deception, participants were given an extended debriefing on the true purpose of the study and reminded that they could withdraw their data at any point then or afterwards. No time limit was imposed on considering the implications of the debrief before signing a second consent form but all participants did so within a few minutes.

Table 7.1

Study 5(a) Phenomenological Measures Question Text

Measure	*Instruction text*
Pre-experiencing	*While imagining the event, I feel as though I am living/ experiencing it*
Mental time travel	*While imagining the event, I feel that I travel forward to the time when it would happen*
Visual	*My representation for this event involves visual details*
Auditory	*My representation for this event involves sounds*
Olfactory	*My representation for this event involves smells/tastes*
Visual perspective	*I primarily see what happened from a perspective as seen through 1 (my own eyes), 7 (an observers eyes)*
Location	*The location where the event takes place is clear*
Spatial objects	*The relative spatial arrangement of objects in my representation for the event is clear*
Spatial people	*The relative spatial arrangement of people in my representation for the event is clear*
Emotionality	*While imagining the event, I feel the emotions I would feel if the event occurred*
Valence	*The emotions I have when I think about doing this are 1 (extremely negative), 7 (extremely positive)*
In words	*While imagining the event, it comes to me in words*
Coherence	*While imagining the event, it comes to me as a coherent story and not as an isolated scene*
Importance	T*his event is important to me.*
Desirability	*How desirable is this event?*
Motivation	*How motivated were you to perform well in this task?*
Task difficulty	*How difficult did you find the task?*
Time to plan	*Did you feel that you had adequate time to plan your mission in room 291?*
Told the truth	*Please rate the extent to which you told the truth about your intentions during the interview*

Note: Scale*:* 1 (*not at all*), 7 *(completely)*

7.3 Study 5(a) Results

Manipulation checks. Participants indicated the extent to which they had told the truth during the experimental interview and subsequent drawing task. Data for this question were missing from three liars and one truth teller. Liars rated the veracity of their performance as significantly less truthful (M = 3.21, SD = 1.78) compared to truth tellers (M = 6.40, SD = .95), $t(48.07) = -9.14$, $p < .001$. There were no group differences on task factors such as desirability, motivation, difficulty or having sufficient time to plan, suggesting that differences in performance were not explained by disparity in these measures between the conditions. There were no group differences in time the length of time at the university or frequency with which the shop had been visited each week. Means, standard deviations and statistics for variables operating as manipulation checks are presented in Table 7.2.

Phenomenological ratings. Liars indicated that they found the planning phase more emotionally arousing (M = 4.92, SD = 1.65) than truth tellers, who were planning an activity that they truly intended to carry out (M = 3.89, SD = 1.83), $t(70) = 2.5$, $p = .02$. There were no differences on any other phenomenological variable. Means, standard deviations and the results of independent samples t tests performed on the phenomenological variables are presented in Table 7.3.

The order in which the reverse chronological instructions were presented (first, second) was counterbalanced across groups. To check that this manipulation did not impact on the phenomenology of events, multi level modelling analyses were run on all self-rated measures, including manipulation checks. There was no change to the pattern of results on any variable when the order of instructions was added as a factor.

Table 7.2

Study 5(a) Descriptive and t-test Statistics for Manipulation Checks

	Liars		*Truth tellers*		*t-test*	
Measure	*Mean*	*SD*	*Mean*	*SD*	*t*	*p*
Task factors						
Importance	3.14	1.73	2.81	1.70	.82	.41
Desirability	4.08	1.52	4.39	1.55	-.84	.40
Motivation	5.08	1.36	5.14	1.62	-.16	.88
Difficulty	2.83	1.48	2.78	1.51	.16	.88
Time to plan	6.75	.50	6.61	.94	.79	.43
Experience						
N weeks on campus	6.58	2.99	7.00	2.91	-.60	.55
N shop visits per week	3.56	.94	3.44	.94	.50	.62
Veracity						
Told the truth*	3.21	1.78	6.4	.95	-9.14	.001

Note: *Liars n = 33, truth tellers n = 35, equal variances not assumed, df = 48.07.

Table 7.3

Study 5(a) Descriptive and t-test Statistics for Phenomenology by Veracity

Measure	*Condition*					
	Liars		*Truth Tellers*			
	M	*SD*	*M*	*SD*	*t*	*p*
Autonoetic						
Pre-experiencing	4.83	1.48	4.61	1.54	.62	.53
Mental Time Travel	4.5	1.34	3.92	1.7	1.62	.11
Autonoetic (*M*)	4.67	1.24	4.26	1.44	1.28	.21
Sensory						
Visual	5.92	1.08	5.94	1.12	-.11	.92
Auditory	3.42	1.95	3.56	1.96	-.30	.76
Olfactory/gustatory	3.06	1.79	2.78	1.84	.65	.52
Visual perspective	3.00	2.46	2.11	1.89	1.70	.09
Spatial						
Location	6.08	1.11	5.78	1.12	1.16	.25
Spatial objects	5.25	1.34	5.50	1.32	-.80	.43
Spatial people	4.33	1.64	4.81	1.62	-1.23	.22
Emotions						
Feeling emotions	4.92	1.65	3.89	1.83	2.50	.02
Emotional valence	4.47	1.13	4.94	1.31	-1.64	.11
Narrative						
Story came in words	3.31	1.86	2.89	1.89	.94	.35
Coherence	4.83	1.63	4.31	1.90	1.27	.21

Note: *df* = 70 except where equal variances not assumed, mental time travel *df* 66.47, Visual perspective *df* 63.86.

Content. Literal verbatim transcriptions were made of the audio-recorded interviews. Both group tasks necessitated navigating from the laboratory to the college shop but only the portion of plans taking place inside the college shop would be expected to vary between groups. When familiarity of location was manipulated by Knieps et al. (2014), statements were coded for the extent to which utterances were related to *navigating to the library* and *navigating in the library*. When participants were unfamiliar with

the library, they said more about *navigating to the library.* Those who were familiar with the library said more about *navigating in the library* but there were no group differences between liars and truth tellers on these measures. Transcripts were edited to the content of each statement that took place while *navigating in the shop* (between walking in and out of the door). Hesitations such as *er* and *erm* were removed. Computer-based word counts were obtained from chronological and reverse temporal order statements.

A 2 (Veracity: Truthful vs. Deceptive) × 2 (Chronological order: Forward vs. Backward) ANOVA was performed on word counts. There were significant main effects for Veracity ($F(1, 70) = 6.04$, $p < .02$, $\eta 2 = .59$) and Chronological order ($F(1, 70) = 16.86$, $p = .001$, $\eta 2 = .52$], and a Veracity x Chronological order interaction effect ($F1, 70) = 7.07$, $p = .01$, $\eta 2 = .64$). Planned comparisons showed that the forward chronological order instruction led to longer statements in truth tellers ($M = 132.61$, $SD = 99.28$) compared to liars ($M = 78.97$, $SD = 45.11$), $t(48.86) = -2.95$, $p = .01$). The reverse temporal order instruction did not differ between liars ($M = 66.78$, $SD = 55.88$) and truth tellers ($M = 75.58$, $SD = 41.53$), $t(70) = -.76$, $p = .45$.

Transcripts of the interviews were used to identify the specific item(s) that participant intended to buy in the College shop. Results were used to populate the final question for study 5(b), which asked judges whether the named item(s) could be identified in each drawing. There were eight instances where the item to be bought was referred to as a *gift* without explicitly naming an object. A Pearson Chi-Square test indicated that this lack of specificity in naming the item did not differ between liars and truth tellers, ($\chi^2(1) = .56$, $p = .45$). There were 11 instances where the item to be bought was named as *Asian food* or *noodles*. Since liars had been instructed to plant the memory stick on the Asian food shelf, this could be a cue to veracity. A Pearson Chi-Square test confirmed that liars (10 of 36)

were more likely than truth tellers (1 of 36) to have named the item they would buy as *Asian food* or *noodles*, ($\chi^2(1) = 8.69$, $p = .003$).

Personality Correlations between personality and the phenomenological variables were examined but showed no obvious pattern of results.

Discussion

The study set out to experimentally-induce intention (true intention, deliberately concealed intention) to examine effects on word count, phenomenological self-ratings, and drawings (examined in study 5b). Participants who were thinking of a believed future event during interviews were anticipated to say more than those who described a cover story and concealed their true plans. Truth tellers said more than liars and this significantly differed in response to a forward chronological order instruction. Adding a reverse chronological order instruction did not lead to group differences in the amount said. Planning a mock crime led to more emotional arousal (but no difference in valence) compared to planning a truly intended task. The autonoetic, sensory, spatial, emotional and narrative qualities of anticipating the planned event did not vary regardless of whether the scenario described was truly intended or was a cover story.

An immediate question to be addressed is the question of whether the intention induction was successful. Although results showed that the extent to which participants lied differed between the groups, liars' deception was rated just below the mid point of the scale, (Ms truth tellers 6.4, liars 3.21). Clearly the experimental groups differed on this variable but this group difference might not have been large enough to create variance in the phenomenology of planning. When interviewed about their plans, instructions constrained participants to describe their representation of the event from *leaving the laboratory to travel to the shop* up to the point

where participants were *standing at the till waiting to hand over the letter*. In line with Knieps et al. (2014), participants' plans can be thought of in terms of the portion relating to *navigating to the shop* and the portion relating to *navigating in the shop*. One explanation for the lack of group variance could be that when rating the future event, participants thought more about the portion of the story in which neither group were required to lie: *navigating to the shop*. The advantage of having had participants tell the story in forward and reverse chronological order (counterbalanced) is that all participants were primed to think of the plan twice: once in forward chronological order starting with *navigating to the shop* and a second time in reverse chronological order starting from the end of *navigating within the shop* (the critical section that differed between truth tellers and liars). Thus it seems unlikely that self-ratings on the phenomenology of plans were front-loaded by the relatively truthful component *navigating to the shop*, which was truly intended by both groups. When analyses were re-run using multi level modelling to examine whether the chronological order in which participants first described the scenario impacted on phenomenological or manipulation check measures, there was no change to the pattern of results. Thus the intention manipulation appears to be validated as the source of task variance between liars and truth tellers.

In contrast to results of studies 1, 3 and 4 of this thesis, the results of study 5(a) suggest that experimentally manipulating intention had no impact on the degree to which participants used episodic future thinking when describing their plans for an event set one hour into the future. Episodic future thinking in this study was indexed by the mean score of two questions: *While imagining the event, I feel as though I am living/ experiencing it* and *While imagining the event, I feel that I travel forward to the time when it would happen*. The evidence for episodic future thinking in previous studies using the Gothenburg method has been based on answers to a question on whether the participant formed a mental image while making the plan. This question was not asked in the present study

and so it is difficult to compare this result with previous research using the Gothenburg method but does make it possible to compare the results of this study with the broader field of mental time travel research, in which contrasts of self-ratings of the subjective experience of mental time travel and pre-living are widely used as measures of episodic future thinking. A recent distinction has been made between events and scenes (Sheldon & Chu, 2016; Sheldon & El-Asmar, 2018). It is possible that the mental image referred to in research by Kneips and colleagues was more akin to a scene whereas the induction of looking forward and describing the trip to the shop in the present study elicited processes more related to an event. Future research directly contrasting these two types of representation but emphasising the future orientation to participants would be an interesting extension to this design.

All participants were interviewed in both forward and reverse chronological order. Results showed that truth tellers said more than liars in forward chronological order whereas the reverse instruction led to similar statement length whether or not the participant was telling the truth. This null effect with reference to the reverse chronological order instruction replicates results of one other study, published after data collection for study 5, which manipulated the chronological order instruction in a similar paradigm (Fenn et al., 2015). In the present study, the reverse chronological order alone did not lead to group differences by veracity, but truth tellers said more than liars when the content derived from both sets of instructions was combined. The content of statements was not analysed for the number of new details generated, so this result does not eliminate the possibility that more information might be generated by using both forward and reverse chronological order to strategically interview a witness or suspect. As previously discussed, using the reverse temporal order instruction was also useful as a manipulation check to ensure that participants were not primed to start the interview in the part of the story that did not require a lie to be told (*navigating to the shop*).

Previous research has shown that lies are often embedded in otherwise accurate or truthful statements. For example, in the mission study conducted by Vrij and colleagues (2010), false locations for meeting secret agents were found to be geographically very close to the real locations where participants had met that agent. Exploratory analysis of the content of transcripts indicated that the object that liars said they would be buying in the shop was more likely to be located in the Asian food section, which was the area of the shop where the liars' mock crime (hiding a memory stick) was intended to be carried out. This finding could be interpreted as evidence that at least one third of liars were using an embedded lie technique: the cover story was close to the truth but avoided the critical phase of the mock crime (placing the memory stick on the shelf). However as only one third of liars employed this technique, it could not be described as a reliable diagnostic cue to deception in applied contexts, although perhaps could warrant further experimental investigation.

To summarise the results of study 5, participants who were describing a scenario they intended to carry out in one hour did so in more words than participants who were concealing their true plans. Even though concealing true plans was a more complex planning task (true plan + cover story), and thoughts about this scenario were rated as more arousing, concealing intention did not lead to variance in autonoesis, sensory, spatial, narrative or valence.

A second experiment study 5(b) was designed and carried out on the drawings that were obtained in study 5(a).

7.4 Study 5(b) Drawing rating task

Introduction

Drawings have been employed as a non-verbal tool for investigating the qualities of anticipated or experienced events in a handful of deception detection studies about past events, for a recent review see Mac Giolla et al. (2017). Sketches can be useful as a means to conduct information gathering interviews with populations in which language or communication barriers exist (Vrij et al., 2018). The rationale for using drawings in deception detection studies is based on reality monitoring criteria whereby experienced events are encoded and recalled with a greater degree of spatial and visual content, markers that help us to distinguish real from merely imagined experiences (Johnson & Raye, 1981; Johnson et al., 1988). When asked to draw an event that was not experienced, a liar is hypothesised to find it more uncomfortable to commit detail to page compared to the relative ease of avoiding mentioning details in a verbal statement (Mac Giolla et al., 2017). While it may be relatively easy to fudge spatial details when describing these verbally, making a drawing forces the person to explicitly demonstrate how the environment was laid out and who or what were present or absent from the scene.

Sketches of the layout of the location in which an event took place are sometimes used alongside verbal statements as a means by which to reveal inconsistencies between the two types of representation of the same event (Vrij, Leal, Granhag, Mann, Fisher, Hillman & Sperry, 2009). This method has been applied to situations where liars were drawing an imagined setting and truth tellers were drawing an experienced setting (Leins, Fisher, Vrij, Leal & Mann, 2011). Across two experiments, liars' drawings and statements were compared and were found to be less consistent than those produced by truth tellers. Drawings can elicit more detail when used in conjunction with verbal interviews in interpreter-based interviews (Vrij et al., 2018).

One of the earliest experiments to investigate drawings as a method of detecting deception was conducted with a small sample of serving or retired military and police officers (Vrij, Leal et al., 2010). Participants were briefed to collect a package from Agent A and deliver this to Agent B and were assigned to lying (*n* = 16) or truth telling (*n* = 15) conditions on the basis of which of two answers they had been told was the expected response to the question *Do you have the time please?* In fact the interviewer always gave the same answer to all participants, so that truth tellers told the truth and liars lied when they were intercepted. During the interview, the first task was to visualise the location where the package from Agent A had been handed over and then describe this in words. A second task was to visualise themselves standing at the same location again and sketch the same scene in as much detail as possible showing what they saw. Interviews were transcribed: 2 pairs of coders rated the drawings and a third pair of coders rated the transcripts. The summary of coding and results reviewed here is limited to the variables of interest to study 3(b), namely detail, plausibility, visual perspective and bystanders.

The definition for plausibility used by coders examining verbal statements and drawings in the study by Vrij et al. (2010 p. 590) is stated as: *the coder could imagine the person actually standing there*. For transcripts, the dependent variables were the number of details about the scene that were mentioned (in words) and statement plausibility as rated on a Likert scale from 1 (not plausible) to 7 (very plausible). Two new coders rated the drawings for detail and plausibility (1 = low, 7 = high). A third pair of coders assessed the visual perspective from which the sketch had been made. Judgements were assigned to one of two perspectives: *camera-on-the-shoulder* or *overhead*. The same pair also rated whether the drawing depicted a second figure, labeled a bystander, presumably Agent A.

Vrij, Leal et al. (2010) reported that judges agreed on the visual perspective of all but two drawings, which were resolved by discussion.

Results from χ^2 analyses were reported for the camera-on-the-shoulder perspective, which was present in 53% of truth tellers' drawings and 19% of liars' drawings. Drawings of true scenarios (80%) were more likely to include a bystander. Bystanders were absent in 87% of liars' drawings. Inter-rater reliability for plausibility was low (r = .48). The authors comment that inter-rater reliability in a range of .4–.6 is not unusual in deception detection coding schemes (Vrij, 2005). Despite low reliability, scores were averaged between the two coders and on this basis truth tellers' drawings were rated as more plausible than liars' drawings. Further analysis found a significant correlation between the presence of a bystander and higher plausibility ratings. Although two different pairs of raters made these judgements, this does not discount the possibility that the presence of a bystander in a drawing led to a greater percept of plausibility. The low power of this study (n = 31) is not atypical in this type of research.

Plausibility and detail were also examined in a study in which participants told the truth (n = 17) or lied (n = 16) about their occupation and place of work (Vrij, Mann, Leal & Fisher, 2012). In this study, participants were interviewed and made drawings about their workplace. A single coder rated the plausibility of the drawings by answering the question *can you imagine the person working here?* on a 7-point Likert scale. Detail was also rated on a 7-point scale. The number of bystanders depicted in the drawings was counted and the level of detail in which any bystanders present were represented was rated on a 7-point scale. Where bystanders were present, drawings were compared to transcripts on a six-point scale: 1 (*people were mentioned in the interview but were not sketched in the drawing)* and 7 (*people were sketched in specific places and specific details about them were given e.g. use of adjectives or actions or including their name).* Inter-rater reliability for coding was assessed by comparing ratings on 33% of the drawings and is reported as: *detail in the drawing*, r = .66; *plausibility*, r = .72; *number of bystanders*, r = .95; *detail of bystanders*, r = .96. Results indicated that the level of detail, perceived

plausibility and the number of bystanders were all found to be significantly greater in truth tellers' drawings.

The exact nature of what underlies judgements of the plausibility of drawings is difficult to ascertain on the basis of the small number of published studies and the small size of data sets where this has been reported. Such studies have used pairs of judges or multiple judges, sometimes with levels of reliability that would not be acceptable in other areas of psychological research. Study 1(c, d) and 4(c), of this thesis demonstrate the problems in establishing the reliability of agreement on ratings of likelihood or plausibility. On the basis of study 1 results, it was of particular interest to see if there would be more agreement in study 5(b), where the material being rated was visual rather than verbal. Low reliability for ratings on detail and plausibility, much as was found in study 1(d) was predicted. In the present study, visual perspective and the presence or absence of a critical item (to be bought in the shop) were also examined. Since ratings were based on drawing content, it was hypothesised that agreement might be reliable on at least these concrete aspects of the drawings.

Visual perspective has been examined as a potential cue to experience or deception such that a true event is suggested to be more likely to have been seen from a first person perspective. However current thinking on visual perspective suggests that categorising what constitutes a third person perspective is more complicated than a dichotomous choice between field and observer views (Rice & Rubin, 2011). Furthermore, there may be individual differences at play such that some individuals are more likely to see past or future events from the third person view (McDermott et al., 2016). It was of interest to see if more of the liars' drawings would be rated as drawn from a visual perspective as if from above (like a map) compared to over the shoulder, although this distinction taken from previous deception detection studies about meeting an agent

or drawing the work place might not hold in the experimental paradigm. Study 5(a) participants had been given a map to use for the planning phase, which may have primed participants to encode the shop scenario in a *from above* perspective. An additional measure was based on the hypothesis that truth tellers' drawings would correspond with the verbal statements they had made about the future scenario. Specifically, they would be more likely to depict the item or items they had stated they were intending to buy in the shop when making the sketch.

Only one other study has assessed drawings of a future (never experienced) scenario and these drawings were also obtained from the Gothenburg method (Calderon, Mac Giolla, Ask, & Granhag, 2018). Ratings were made by 117 judges, who viewed 56 drawings that had been made in an earlier study (Granhag & Knieps, 2011). Analysis of the drawings had not been reported before. Judges answered a single question about each drawing. The question centred on construal level theory (Trope & Liberman, 2010). Concrete representations are more immediate, abstract representations are higher order and represent a greater psychological distance. Judges were first trained with definitions of concrete or abstract construal level representations with the following definitions. Concrete drawings were defined as:

> *Drawings that represent complex scenes, refer to a specific context, focus on surface aspects of a task, and include details that are irrelevant to the goal at hand (in this case purchasing a gift in a shopping center).*

Abstract drawings were defined as:

> D*rawings that represent simple scenes, that are decontextualized, refer to core aspects of a task, and include details that are relevant to the goal at hand (in this case purchasing a gift in a shopping center).*

Results showed that liars' drawings were perceived to be more abstract,

and inter-rater reliability for this single question was extremely high (r = .935). No other analysis on the drawings was reported in this publication.

In the absence of any other literature on the use of drawings made about truly anticipated or deceptively represented events set in the future, the results of study 5(b) were difficult to predict on the basis of previous research. As such, study 5(b) make a useful contribution to existing knowledge on the validity of using drawings to detect deception and an entirely novel contribution to the study of drawings where deception is exclusively concerned with future activities.

Method

Design and Participants

Drawings made by 72 participants in study 5(a) were assessed in two phases. Phase 1 judges were three males aged 20–25 who were members of an eyewitness memory laboratory group at Royal Holloway, University of London. Two of the judges were undergraduate students, the third was a research assistant employed by the University. In Phase 2 drawings were coded for the presence of bystanders by the author and a second coder, not affiliated with the same laboratory group. Rating was carried out by separate groups to ensure that plausibility scores would be independent of bystander scores. Examples of drawings can be seen in Appendix O.

Materials and Procedure

Drawings of a future event that was planned to take place in the college shop were made in response to the instruction *I would like you to draw me a picture of yourself standing in front of the shelf choosing the gift*. The creators of the drawings (often referred to in the literature as senders) were either telling the truth (truth tellers, *n = 36)* or were aiming to conceal

the true purpose of the visit to the shop *(liars, n = 36*). Drawings were made in black pen on plain A4 paper, which were scanned and saved as monochrome jpeg files. The images were not cropped so that the proportion of the page that had not been drawn on was clearly visible. Participants viewed the images on a wide screen monitor in a laboratory in the Department of Psychology, Royal Holloway, University of London.

Phase 1: 72 jpeg images were presented one at a time. The order of viewing was randomised for each participant. Time to view each image was unconstrained. Four questions were presented for each image. The first two questions required detail and plausibility to be rated on Likert scales from 1 (*not at all*) to 7 (*completely*). The questions were taken from previous research (Vrij et al., 2010; Vrij et al, 2012):
How detailed is the drawing?
I can imagine the sender being in this place

Next, judges rated the visual perspective of the drawing, which was posed by the question text:
Is the picture drawn 1 (over the shoulder or 2 (from above)?
The final question was on the presence or absence of the item(s) named as the target purchase from the College shop in study 3(a). Each item(s) was named and followed by the text: *Is this item present in the drawing (the item that the participant stated they were going to buy in the shop)?*

Phase 2: Drawings were rated for the number of bystanders in the image and the level of detail in which any bystanders were drawn. Two judges viewed all 72 drawings on a Macbook Air 11" laptop. After examining each drawing, judges recorded the number of people seen in the picture, other than the drawing sender (the figure believed to represent the person who made the drawing). A single figure in each drawing was assumed to depict the sender. Drawings containing more than one figure were coded as *bystanders present*. Figures within television or cinema screens or in

paintings on a wall were not counted as bystanders. Animals were not counted as bystanders. Where bystanders were present, judges rated the level of detail in which bystanders were depicted on a Likert scale from 1(*very low*) to 7(*very high*).

7.5 Results

Phase 1: Reliability. Individual ratings from the three judges were compared to see if these could form reliable scales for visual perspective, item present, plausibility and detail. Judges showed poor agreement on the visual perspective of drawings and on whether the named item (that was going to be bought in the shop) was visible in the drawing. Judges' agreement on the level of detail in drawings was good. Judges' agreement on plausibility was adequate. On this basis, further analyses on group differences between judgements on the detail and plausibility of drawings made by liars and truth tellers were carried out. Reliability statistics for drawing ratings by three judges are shown in Table 7.4.

Table 7.4

Reliability of Detail, Plausibility, Viewpoint and Item-present Judgements

Variable	*Scale*	*Statistic*	*Judges*		
			1 vs.2	*2 vs. 3*	*1 vs. 3*
Detail	1–7	ICC *	.72	.84	.76
Plausibility	1–7		.66	.54	.70
Viewpoint	Shoulder, above	Kappa	.39	.38	.21
Item present	Yes, no		.40	.50	.34

Note * Intra-class correlation (average measures)

Phase 1: Discrimination. The mean of the three judges ratings were used to compute a variable for plausibility and a variable for level of detail. Independent samples t-tests on details ratings showed that drawings made by liars were judged to be less detailed (M = 2.62, SD = .98)

compared to drawings made by truth tellers (M = 3.32, SD = 1.33), $t(70)$ = 2.53, p = .01. There was no difference in the perceived plausibility of drawings between liars (M = 3.06, SD = 1.23) and truth tellers (M = 3.55, SD = 1.39), $t(70)$ = -1. 59, p = .12.

Phase 2: Discrimination. Two judges agreed on the presence or absence of bystanders in all but two drawings, which were resolved by further discussion. The frequency with which bystanders were depicted by liars and truth tellers in 72 drawings is shown in Table 7.5. Two cells had an expected count less than 5 so that a Fisher's Exact Test was more suitable than a Chi-square test to analyse these data. Results showed that the frequency with which bystanders were depicted in drawings did not differ between liars (8.33%) and truth tellers (13.88%), p = .36, 1-sided.

Table 7.5

Crosstabulation of Bystanders In 72 Drawings

Bystanders	*Liars*	*Truth tellers*
Present	3	5
Absent	33	31

Discussion

Study 5(b) was carried out to examine the extent to which the level of detail, perceived plausibility, drawing perspective (over the shoulder, from above) and the presence of a named item could be used as cues to deception in drawings about future scenarios. Drawings were sketches of a future event that was planned but not carried out. Participants in study 5(a) drew themselves carrying out the task they had planned. The specific instruction was for each person to show his or herself standing in the college shop at the shelf where they were choosing the item they had gone to the shop to buy. Drawings were depicting either real plans (truth tellers) or a scenario that was intended to mask the true purpose of the

visit to the shop (liars). Reliability of two measures: *item present* and *visual perspective* could not be established. The more subjective measures of plausibility and detail were shown to be reliable between the three judges. An independent samples t-test showed that detail ratings differed between drawings made by truth tellers and liars. However judges' did not perceive liars and truth tellers' drawings to differ in terms of how plausible these were where plausibility was defined as *I can imagine the sender being in this place*. There was no difference in the extent to which bystanders were shown in drawings made by truth tellers or liars.

The three judges' agreement on plausibility (ICCs .54, .66, .70) was more reliable than previous research in which the same definition of plausibility was employed, *e.g.* Vrij et al. (2010) reported inter rater reliability of .48 and significant results on the basis of these plausibility ratings. In this study the ICC was more reliable but nevertheless the plausibility did not differ between groups. On the basis of differing results for plausibility and detail, it seems likely that judges were rating these as separate constructs but the exact mechanisms underlying judges' ratings for plausibility are not clear from the results of this experiment. If better reliability had been found for the item-present variable, it would have been interesting to correlate this with plausibility, since this was found to be significant in previous research (Vrij et al., 2010). However overall, results from study 3(b) highlight the difficulties of making plausibility decisions about other people. Even though judges shared some experience with senders - they attended the same university and were familiar with the location in which drawings were made - group differences in plausibility were not found.

Research based on a small sample has indicated that visual perspective in deceptive drawings made about past events is related to a viewpoint as seen from above. Had there been better agreement between judges on visual perspective, it would have been interesting to compare the perceived over the shoulder, from above with self-rated own/observer

visual perspective ratings obtained in study 5(a). Future research would do well to train judges to recognise what constitutes a top down or over the shoulder drawing. Some degree of training with feedback may have improved the reliability of this measure.

To my knowledge, only one other study has investigated group differences on drawings obtained from the experimental design employed in study 5(a). In this design, 117 judges recruited on Mechanical Turk answered a single question on abstractness or concreteness based on construal level theory. Agreement between raters was high .935. While theoretically interesting, the authors note that the results may have been influenced by the valence of the two conditions. Positivity is linked to abstraction and negativity to concreteness (Eyal, Liberman, Trope & Walther, 2004). Although liars were more emotionally aroused in study 3(a), there were no group differences in self-rated emotional valence, thus it seems unlikely that emotional valence impacted on the drawing task in this experiment.

7.6 On a Mission General Discussion

In this study it was assumed that intentions (intended, not intended) would map onto psycho-legal investigations of veracity (truth tellers, liars). The study also extends findings on intended/not intended past and future at a distance of two weeks (study 1b). While the design of study 5(b) provided a method by which to investigate a temporally-close, immediate future scenario using a validated paradigm, intention in this study was not veridical. So far as I know, no participant arrived in the laboratory with a pre-existing intention to visit the college shop or to successfully carry out a mock crime.

While deception detection is not the primary interest of this thesis, the studies that form this PhD may go some way towards answering calls in the psycho-legal literature that investigations into intention would benefit from a clearer understanding of latent processes of holding an intention to carry out an act. Study 1(b), (c), (d) indicated that when participants sampled events that were experienced or not experienced (past) or were intended or not intended (future), self-rated phenomenology and number of words used to describe the events was differentiated by the intention to carry out (future) or to have carried out (experienced past) these activities. study 5 replicated the word count finding of Granhag and Knieps 2011 and extended this by manipulating the temporal order in which participants described the intended action (chronological, reverse). Results indicated that the reverse temporal order instruction did not lead to group differences in statement length. This finding was in line with one other study to have used the reverse temporal order instruction (Fenn et al., 2015).

Results showed that liars were more likely to use a cover story that was physically located close to the place where the mock crime was due to be carried out. Results supported previous research that has indicated statements are longer and drawings judged as more detailed when events

are intended. Visual perspective proved difficult to rate in this study. Contemporary thinking is that numerous factors can be shown to influence the perspective with which both memories and future thoughts are generated. These include the types of cues used and individual differences in spatial imagery. It would be interesting to see if these factors known to influence visual perspective in mental time travel can also be shown to vary in drawings of truly intended events. Training and feedback for judges would be essential to improve the poor reliability for two of the measures used to examine drawings: visual perspective and item present. The drawings made in study 5(b) have not been examined for differences in construal level and would be suitable for use in a replication of the recent study by Calderon and colleagues (2018) in which judges found liars drawings to be more abstractly represented.

Since there was no evidence of phenomenological group differences, it could be that this paradigm did not elicit episodic future thinking. This seems unlikely as the autonoetic measure received ratings at the higher end of the scale (*M*s: liars, 4.67, truth tellers, 4.26). Another explanation is that making a drawing of the future event in between the verbal interview and the rating task affected the way that the simulation was subsequently evaluated. Granhag & Knieps (2011; 2014) found that truth tellers were more likely to have formed a mental image during planning than liars. In this study, participants described the future event, made a drawing and then rated the phenomenology of the event so that autonoesis was measured by scales and not by asking the mental image question. It could be that in making the drawing, disruption was brought to bear on self-assessment of the phenomenological variables, eliminating group differences in the subjective ratings that were made immediately afterwards. A recent study in which photographs were contrasted with verbal cues to generate future representations in familiar vs. unfamiliar locations showed that photographic cues constrained rather than enhanced self-reported sensory details when scenarios were in familiar

settings (and did not lead to enhancement of scenarios for unfamiliar locations) (Bays, Wellen & Greenberg, 2018). A third interpretation is that the manipulation was successful: all participants used episodic future thinking, regardless of whether or not they were concealing their intentions in the interviews and drawings and thus there were no group differences.

One direction for future research could be to investigate temporally close future events set within one hour that are intended or not intended without the element of concealing true intention. It would be interesting to manipulate the scene vs. event perspectives when asking about plans. Another way to ascertain the extent to which episodic foresight was engaged would be to examine the content of statements for internal and external details using coding adapted from the Autobiographical Interview (Levine, Svoboda, Hay, Winocur & Moscovitch, 2002).

Chapter 8

Overall Discussion

> *The book advances four main theoretical entities: scripts, plans, goals and themes. Each of the four is somewhat less well defined than its immediate predecessor. We feel we really understand scripts, are pretty sure about plans, somewhat less certain about goals and completely uncertain what lies beyond that. Nonetheless, we feel strongly that our ideas are significant enough to warrant publication. We hope that the reader will allow for the imperfections of work that is still in its infancy.*

From the introduction to *Scripts, Goals, Plans and Understanding* (Schank & Abelson, 1977)

The aim of the research presented in this thesis is to tap into processes of veridicality in mental time travel. In doing so, careful attempts have been made to identify stimuli that can be used to prompt both salient and not salient events in the recent past and near and more distant future. The argument that the autonoetic component of mental time travel can be independent of episodic future thinking has been advanced in recent literature. Klein (2012) has suggested that a sense of self is derived from a combination of faculties that reach beyond episodic or semantic memory and include the ability to experience continuity of personal identity through time. An attempt has been made to tap into such processes using novel methods. Research in this thesis has shown that salient events set two weeks and one year into the future are vividly more similar than events that are imagined but not truly anticipated to occur (study 3). Events set two weeks around the present that varied by salience were more similar in their phenomenology in study 1(b) and these findings were echoed in the shorter measure of subjective characteristics used in study 4(b).

This thesis also draws on current and recent literature that has been interested in the absence or presence of hallmarks of intention in applied contexts. The need to find new innovations in deception detection means that researchers working in this field of psychological science are not afraid to try new methods, sometimes ahead of theoretical understanding. The application of drawings as a means to capture hallmarks of intention is one such new direction. In the research in this thesis, participants in study 4 made drawings of intended and not intended events in the past and future. These were viewed and rated by judges, who employed methods from psycho legal research to evaluate this material. Results added to a very small literature on drawings made of events that vary by the presence or absence of real intention or experience. This study also provides a useful comparison point for detection deception researchers interested in contrasting no intention with the concealment of intention. In study 5 an entirely novel contribution to this literature has been made. To my knowledge, only one other study has been published that reports analyses of deceptive and truthful drawings made about future events (Calderon et al., 2018). These authors drew on construal level theory to pose a single question to multiple raters. Study 5 of this thesis reports the results of a number of measures that are currently of interest within the field: detail, perceived plausibility, drawing perspective (over the shoulder, from above) the number of bystanders present and the presence of a target item. These measures have their origins in a similar literature to memory and future thinking science in that they draw on internal processes such as visual perspective or reality monitoring to understand the phenomenology of the self.

This thesis shows that participants can simulate and describe events that they have not experienced or do not have any intention to carry out in specific spatio-temporal contexts. Comparisons between these not-believed simulations and pre- or re-experiencing believed events are

striking. Belief in the occurrence of events rather than temporal direction or distance has been shown to significantly enhance self-ratings of the phenomenology of mental time travel. These studies add to the emerging picture that belief in occurrence is an important consideration when asking participants to think about the personal past and future. These studies also add to psycho-legal literature that has explored whether hallmarks of true intention can be identified by showing the phenomenology of future thinking where intention is absent (studies 1, 3 and 4) or concealed (study 5). It is possible that these studies lead to more questions than they answer, since attempts to apply new methods of detecting deception in drawings proved to be unreliable for the most part. Results show how difficult it is to establish inter-rater reliability for measuring plausibility of both verbal and pictorial material. However the finding that the perceived level of detail could discriminate deceptive from truthful drawings is an entirely new contribution to this literature.

8.1 Overview of research

Key findings of each experiment are now outlined, followed by a summary of results (8.2), theoretical implications of the thesis (8.3), practical and applied implications (8.4) and avenues for future research (8.5).

Study 1 The prospective experience of a future event that is seen as a real and expected event that will form part of a continuum of personal experience was shown to feel as vivid as remembering an experienced event in the recent past when measured by self-rated autonoesis, and sensory and spatial qualities. These differences were also shown in longer statements. Study 1(c) examined the plausibility and likelihood of transcripts from study 1(b) when rated by third parties. Real memories were seen as more detailed than descriptions of imagined but not experienced past events. Descriptions of future acts that were believed to be likely to happen were seen as similarly plausible and likely as merely imagined future events when evaluated by judges. No firm conclusions

about what informs judgements of plausibility and likelihood could be drawn from transcripts of verbal interviews on past and future activities that were examined in this study. This finding highlights the need for future research and theory-driven explanation of how plausibility operates in interpersonal judgements.

Study 2 The impact of intention as a potential mnemonic was explored in a series of two pilot studies and three experiments. Words encoded in the context of the future are better remembered than atemporal or past scenarios (Klein et al., 2010). Study 2 extended this finding to see whether the salience of a believed event set two months in the future would act as a mnemonic. Results showed that the relatedness of word lists to an encoding scenario led to preferential recall regardless of belief in current plans. However the design lacked a control condition and may have lacked power. This study did not examine the impact of event salience on susceptibility to false memories, which would be a plausible next step for this research.

Study 3 The salience of plans and goals was operationalized as if it were analogous to true intention at a distance of two weeks and one year. Results showing that significant differences in the vividness of episodic future thinking and autonoesis were related to salience more than temporal distance. This study also confirmed that the ability to identify events that are believed to represent the anticipated future can be extended to a distance of one year.

Study 4 The application of drawings as a means to capture hallmarks of intention is arguably a new direction. Participants in study 4 made drawings of intended and not intended events in the past and future which were viewed and rated by judges who employed methods from psycho-legal research to evaluate this material. Results added to a very small literature on drawings made of events that vary by the presence or

absence of real intention or experience. This study also makes a useful comparison point for detection deception researchers interested in contrasting no intention with the concealment of intention.

Study 5 When someone is deliberately deceiving another person about a temporally-close event by using a cover story, drawings may be less detailed and statements relaying the chronological order of events may be longer but there is no evidence of any variance in episodic future thinking in terms of autonoesis, sensory, spatial or narrative qualities.

8.2 Summary of results

When studying episodic future thinking with younger adults aged 20–30, the degree to which the event is believed to be going to occur will impact on the quality of the simulation and description of the event. Evidence for this is found in higher ratings for autonoesis, sensory and spatial qualities, longer verbal statements and more detailed drawings and descriptions as rated by others. Study 1(d) showed that contextualising the judgements by making raters aware that events varied on the basis of belief in occurrence enhanced the ability of raters to detect a level of detail that had been previously confirmed by transcript senders.

The impact of intention at two weeks also held when events were set at two weeks and one year but varied only by personal salience. The difference in believed and not believed past and future events was replicated with younger participants aged 16–18, who simulated then drew real and imagined past and future events and reported that mental time travel varied on the basis of belief in occurrence. However, age and education-matched judges were not able to agree on what constituted detail, plausibility or the presence of bystanders within the drawings.

Having the intention to carry out an act in the future does not act as a mnemonic. The extent to which this paradigm engaged processes of

episodic future thinking during encoding is not known. Similarly, the extent to which participants in study 5 were using pre-experiencing is not clear but certainly this did not vary on the basis of intention to carry out a mock crime.

Some of the findings of the thesis were at odds with current literature. For example, it was not possible to obtain reliability for judgements on the plausibility of past or future events when these varied on the basis of belief in occurrence. This measure has been reported to be able to discriminate true and deceptive descriptions of future events with 70% accuracy (Vrij, Granhag, et al., 2011; Vrij, Leal, et al., 2011). The number of bystanders found in deceptive (study 5) and not-intended (study 4) drawings was not indicative of any variance in participants. In study 4 events differed in the number of bystanders that might be expected to be present (for example, a cinema trip compared to trying a new recipe). However, care was taken to use raters who were age-matched to drawing senders so that plausibility judgements might be contextualised by shared experience. This did not lead to more reliable estimates of plausibility, which in itself is a significant finding.

8.3 Theoretical implications of the thesis

The studies in this thesis provide evidence that mental representations of personal events across time vary on the basis of belief in occurrence. An examination of the detection of hallmarks of veridical belief using methods taken from recent psycho-legal research has been carried out. On the basis of the results reported here, reliable objective hallmarks of belief in occurrence are elusive. This is perhaps to be expected, given that memory is not a faithful record of real experience but is a generative process. Very strong evidence would be needed to show that its corollary in prospection could be objectively reliable. Thinking about the future can only ever be imagining, since future representations have not been verified by time.

Thus finding that future scenarios can be differentiated in terms of personal belief in occurrence is surprising, and providing evidence that veridical belief in occurrence leads to qualitative differences in contextual and perceptual aspects of prospection is even more surprising. These results make a significant contribution to the literature on memory and future thinking and suggest that cues used in this type of research should be carefully considered in light of the extent to which will be likely to engage veridical belief in occurrence.

8.3 i Past vs. future. Previous research contrasting prospection with recollection has shown a pattern of results that suggests that past events are characterised by heightened perceptual and spatial vividness, whereas future events elicit somewhat reduced phenomenology but heightened significance in terms of positive valence and greater personal importance (Addis et al., 2007; Berntsen & Jacobson, 2008, D'Argembeau & Van der Linden, 2006; Ernst & D'Argembeau, 2017; McDonough & Gallo, 2010; Spreng & Levine, 2006). Studies 1 and 4 examined prospection and recollection of believed and not-believed events at a distance of two weeks around the present. By introducing variance in belief in occurrence, the results of study 1b showed a different pattern to that found in previous literature. Believed events were more vivid whether they were set two weeks in the past or two weeks in the future. This pattern affected perceptual features such as visual, auditory, olfactory and gustatory variables. Believed events were contextualised as more important, desirable, coherent and more positive in valence, regardless of whether these were recent memories or believed events set in the near future. Believed events were also accompanied by a greater sense of mental time travel whereas the second component of the autonoetic measure, p/re-experiencing, showed a main effect of belief as well as time.

This pattern of main effects of belief was replicated in study 4, where participants completed a much shorter measure of phenomenology to contrast believed and not believed events, again set two weeks in the past and future. This time, sixth form pupils aged 16–18 rated the subjective features of these recent-past and near-future events. They also drew pictures depicting the events they had envisaged. Self-ratings of the subjective experience of these simulations showed that visual details, sense of location and awareness of the spatial location of people and objects were stronger during simulations of believed events, and these variables also showed a smaller effect of time (past > future) but no interaction. It is possible that this may have been an unintentional artefact of the drawing task, which could have made spatial aspects of events more salient in some way. The limitations of using drawings in research will be discussed later in this chapter. Taken together, the overall pattern found in the results of studies 1 and 4 is that belief had a larger effect than temporal direction on the perceptual and contextual phenomenology of these simulations. Furthermore, while p/re-experiencing showed main effects of belief and time qualified by interactions in both of these studies, the mental time travel component of the autonoesis measure varied only on the basis of belief in occurrence.

It has been posited that an episodic memory is distinguishable from a merely imagined event on the basis that it is accompanied by autonoesis, defined as a subjective awareness of a prior conscious state. This denotes that what is being remembered must have happened before (Tulving, 1983; 1985; Wheeler et al., 1997). Reality monitoring theory indicates re-experiencing is an important marker of veracity when remembering the past (Johnson & Raye, 1981; Foley, 2018). Autonoetic features have received less examination than other aspects of episodic future thinking, (see D'Argembeau, 2016, for a useful summary). There is some evidence that different mechanisms underlie belief in accuracy, belief in occurrence and autonoetic experience in memory compared to future thinking (Ernst &

D'Argembeau, 2017). However, in Ernst & D'Argembeau's study the two components of autonoesis were combined and reported as one construct, so that it is not possible to compare findings. The results of the studies in this thesis suggest there is variance in the component processes of autonoesis between episodic future thinking and episodic memories. The sense of p/reliving was stronger in believed past events compared to believed future (although both types of believed events elicited more p/re-living compared to not-believed events). The sense of the second component of autonoesis, mental time travel, did not differ between believed past and believed future simulations (although, again, this was stronger in all believed events, irrespective of temporal direction).

These findings speak to the observation that the experiential component of mental time travel might persist in memories because belief in occurrence is a separate judgement (Klein, 2016). The design of Studies 1 and 4 essentially pits the re-experiencing of recent past events against pre-experiencing anticipated events in the near future. Results suggest that in this paradigm, one component of the autonoesis measure, mental time travel, was particularly sensitive to the effects of belief in occurrence, regardless of the temporal direction of the event, past or future. It could be that the sense of having travelled in time, relative to the sense of p/re-experiencing an event, was less important to establishing *when* an event took place. That would make this component of autonoesis more vulnerable to source confusions of the type highlighted by the Clinton example given in the introduction to this thesis. The scenario mistakenly described as a memory by Clinton may have elicited a greater sense of mental time travel during encoding, leading to source confusion so that, years later, that future simulation was recounted as a memory.

The results of studies 1 and 4 suggest that the p/re-experiencing component that indexes a sense of re-living or pre-living at a specific moment in time is sensitive to belief in occurrence and also to temporal

direction. This suggests that the p/re-experiencing component of autonoesis is a more accurate orienting marker than mental time travel, and that it may also be less vulnerable to source confusion, at least when the event being thought about is set at a distance of two weeks around the present. Alternative explanations for the Clinton example could be related to self-reference and/or the survival nature of the scenario (Nairne & Pandeirada, 2016; Dewhurst et al., 2017) at encoding or an enhanced propensity for the associative nature of future thinking to lead to false memories (Dewhurst et al, 2016; 2019).

8.3 ii Temporal distance. Studies 1 and 4 contrasted past and future events at two weeks with parallel findings that autonoesis and some contextualising phenomenology varied on the basis of belief in occurrence. Study 2 examined intention as a mnemonic at a distance of two months, using three encoding scenarios but with null results. It may be that the impact of psychological distance was a critical factor to the experimental design (Trope & Liberman, 2003; Liberman & Trope, 2014). Consider the phenomenon of enhanced mental clarity and elevated focus the day before a deadline compared to the more gist-like thinking about work to be completed in three weeks' time. It may be that events set close to the present are more likely to impact on mnemonic processes (as might be suggested by the Clinton scenario).

It seems likely that extending study 2 by manipulating intention at a shorter distance from the present and comparing intended and not intended future scenarios to past or control encoding conditions might make for a more reliable assessment of the impact of intention on recall. Another variable of interest might be emotional arousal or threat perception, which could lead to variance in mnemonic features of pre-experiencing events set close in time that vary on the basis of intention. However one clear avenue for further research is signposted by the evidence that associative features of future thinking lead to greater susceptibility to false lures (Dewhurst et al.,

2016; 2019). Measuring correct and false recall in recent past and future events that vary on the basis of belief in occurrence scenarios could be a fruitful new direction were this series of studies to be extended. In such a study, obtaining self-ratings of the imagined scene would enable further examination of how autonoetic and phenomenological variables differ between these conditions when events are set close in time. However the time-consuming and effortful nature of obtaining scenarios that reliably index intention is made clear in the multiple pilot studies of this thesis, which is one drawback to this type of research.

One way to access belief in occurrence is to ask participants to identify current plans and goals that they are already working towards in the present moment and can anticipate happening at a given distance in the future (Emmons, 1986; Lehner & D'Argembeau, 2016). This method was used to cue simulations of the future in study 3. Globally plausible future events were set two weeks and one year in the future and varied on the basis of how salient these were as current plans or goals. Results showed that perceptual features such as audition, olfaction and gustatory/tactile self-ratings varied on the basis of goal-relatedness. However, to a lesser extent they were also enhanced by temporal proximity. By contrast, clarity and spatial dimensions including familiarity of place, people and objects varied by goal-relatedness but not by temporal distance. Both components of autonoesis (pre-experiencing and mental time travel) varied on the basis of belief in occurrence but not by temporal distance. These results are in line with findings by Lehner and D'Argembeau (2016), who contrasted own goals with experimenter-generated cues (analogous to non-goals) without constraining temporal distance. Results showed similar levels of detail and vividness and the goal-relatedness of events enhanced ratings for autonoesis, which was strongly predicted by the importance of these imagined events for personal goals. Study 3 extends these findings to show that belief in occurrence of events up to a year ahead engages similar autonoetic and contextual features of prospection.

The pattern of variance in contextual but not perceptual features on the basis of belief in the occurrence of future events is similar to the features of believed memories in contrast to real memories. Recollections (real memories) have stronger perceptual features (sensory features) and receive higher ratings for autonoesis. Memories can be endorsed as believed when they are accompanied by contextual information relating to the setting but the sense of re-living is absent (Johnson et al., 1988; Rubin et al., 2003). However the difference in these findings is that believed future representations in study 3 received higher ratings for both dimensions of the autonoetic variable: pre-living and mental time travel. Autobiographical memories compared to veridical future thoughts in studies 1 and 4 received higher ratings for p/re-living. The sense of mental time travel was not distinguished by temporal direction, only by veridicality. In study 3 both types of autonoesis were elevated by veridical anticipation and not affected by temporal distance. This suggests that autonoesis is an important factor in how episodic future thoughts vary on the basis of belief in occurrence and might hint at how it is that people can endorse a future event as 'real' or 'true'. It was therefore of considerable interest to see how autonoesis varied between future thinking for imminent believed events in contrast to future thinking for events that necessitated forming a cover plan. This comparison informed the design of study 5.

8.3iii Deception detection. The final study in the thesis addressed the potential application of the findings of studies 1–4 to the detection of deception about future events. The design reduced the temporal distance of the target event quite considerably. Prospection in this paradigm was for an event anticipated to occur within one hour. On the basis of studies 1, 3 and 4, the sense of mental time travel for this future event might be expected to vary between believed and not-believed simulations of plans. However there were no differences in phenomenology, whether perceptual or contextual, other than heightened emotional arousal in liars. Self-ratings

also indicated no difference in autonoesis between liars and truth tellers. This suggests that episodic future thinking was not engaged at all. This is not at odds with previous findings using the Gothenberg deception design (outlined in detail in the introduction to study 5a). These have not found a reliable thread of evidence for autonoesis in this paradigm, which will now be summarised.

The first experiment using the Gothenberg design showed that truth tellers were more likely to have formed a mental image of their plan, which was accompanied by higher ratings for autonoetic and sensory variables (Granhag & Knieps, 2011). However an extension of the study in which questioning was repeated one week after the planning phase failed to replicate differences in the phenomenology between truth tellers and liars beyond truth tellers reporting a greater sense of location for the place in which they would carry out their plan (Knieps et al., 2013). A further study manipulated the familiarity of the location of the planned event and found no difference in autonoesis and little in phenomenology, except that liars reported a greater sense of the location of people and objects (they were looking out for a secret agent). Truth tellers were more likely to have formed a mental image and reported more visual and olfactory qualities within this mental image of their plans (Knieps et al., 2014). These results suggest that the Gothenberg method does not elicit the autonoetic component of simulating an event in the future or a reliable pattern of phenomenological differences between truthful and lied-about plans. This may be because of the goal-relatedness of both tasks, which engender similar levels of subjective characteristics, removing any discriminant function of self-ratings in this paradigm. One way to test this would be to incorporate a control condition to the design that produced a simulation of the future activity with no goal-related features. However an alternative explanation for the null findings of subjective differences in study 5 is that the inclusion of a drawing task carried out between simulating the plan and rating the features of the plan reduced the availability of the subjective

sense of what it had been like to think through the event in advance. This highlights the potential confounding effect of using drawings in research. The practical or applied implications of the findings of this research will now be discussed.

8.4 Practical or applied implications of the research

The second strand of research in this thesis was concerned with the extent to which other people can identify veridical intention in statements and drawings. This has potential real-world application in criminal investigations if the goal of investigators is to apprehend suspects before they have enacted a planned crime. If deceptive statements intended to conceal true intention could be reliably identified, theoretically this science might be applied to prevent a range of planned criminal behaviour (Clemens et al., 2011; Granhag & Mac Giolla, 2014). Examples include pre-meditated crime, financial fraud, and participation in radicalisation or acts of terrorism. Methods to detect intention could be incorporated into stop and search protocols in the street or developed for use by security personnel at airports. Protocols might be created in order to predict which patients are likely to adhere to treatments and which are not. We live in an age in which big data analysis is increasingly common in government, research and commercial settings, raising many ethical issues (Ajana, 2015). Reliable methods to predict behaviour could improve the profitability of insurance businesses or be used to create medical criteria to assess an individual's risk of developing certain diseases or their likelihood of maintaining habits that are likely to impact on health across the lifespan. The potential application of psychological research examining the predictive reliability of belief in occurrence is clear. However the research in this thesis does not support the hypothesis that hallmarks of belief or intention can be identified, let alone that intentions can reliably predict behaviour.

Protocols to make predictive judgements are already being developed and tested based on their suitability for use in security contexts, for example for use by security personnel at airports (Sooniste et al., 2016; Warmelink, Vrij, Mann, Leal, Forrester & Fisher, 2011) and other transport hubs (Mac Giolla, Ask, Granhag & Karlsson, 2019; Warmelink, Vrij, Mann, Jundi & Granhag, 2012). In addition to the ethical considerations raised by these potential applications, it has long been known by psychologists that intentions are poor predictors of subsequent behaviour, a phenomenon know as the intention-behaviour gap (see Sheeran & Webb, 2018). Even when plans or goals are accompanied by implementation intentions, more than half of intended behaviour is not enacted (Sheeran & Webb, 2016). Thus the findings of this thesis must be framed by strong caveats.

We have long known that miscarriages of justice occur on the basis of unreliable eyewitness testimony and mistaken identification. We have evidence that memory experts and professionals whose work depends on the reliability of such testimony do not agree on what constitutes reliability of memories nor even which features suggest that memories are believable (Akhtar, Justice, Knott, Kibowski & Conway, 2018). It is clear that third-party judgments of plausibility, veracity and likelihood of occurrence about future events that are intended but have not yet taken place have an even greater potential to lead to miscarriages of justice.

This thesis has addressed the question of whether believed and not-believed events in the past and future can be accurately discriminated by other people, a type of interpersonal reality monitoring, (Johnson et al., 1998). Sensory vividness and clarity are seen as hallmarks of credibility in statements (Colwell et al., 2007; Memon et al., 2010). However emotion and detail are not necessarily interpreted as hallmarks of credibility (Justice & Smith, 2018), especially when judges believe that they are being asked to make a credibility assessment (Nahari, 2017). Two types of rating task were examined in the thesis. The first looked at plausibility and

likelihood of occurrence without examining memory characteristics. In study 1c and 1d the content being judged was derived from verbatim transcripts of short descriptions of believed and fictitious (but not lied-about) events (an example script can be seen in Appendix D). Judges had no contexualising information other than whether the event was set in the past or future. No definitions for plausibility and likelihood were given but judges wrote notes on what was informing their likelihood and plausibility ratings (presented in study 1c judges' comments are presented in Appendix F1 and study 1d judges' comments in Appendix F2). Results showed that it was not possible to establish inter-rater reliability for plausibility and likelihood ratings. Examined individually, both judges showed a positive bias for all events to be seen as plausible and likely. The second study included interpersonal reality monitoring by asking judges to examine visual detail and emotion alongside likelihood and plausibility.

In study 1d judges were aware that events varied on the basis of the sender's belief in occurrence, and they knew the design of the study from which the transcripts had been derived. Ratings for visual details proved reliable and showed that real memories were seen as containing more visual details, in line with reality monitoring criteria (Johnson et al., 1988). However judges saw visual details as undifferentiated in future events. Since these events were novel and had not been seen by the sender, other than in the mind's eye, this finding seems quite reasonable. Similarly, there was insufficient inter-rater reliability between judges on emotional content or what constituted a likely or plausible event in future events, so no further analyses were carried out on these ratings. Since judges knew that these events were set in the future, they may have been more circumspect about making these judgements, or may have felt more able to make wild guesses. Reliability was acceptable for emotion and likelihood estimates of past events. Believed past events were seen as more likely to have occurred whereas emotional content was seen as

similar between believed and fictitious past events. Although these results do show some discrimination was possible for past but not future events, further analyses reported in 3.10 show that believed events received higher ratings at the cost of the correct discrimination of fictitious events, which also tended to be endorsed as true. Thus the layperson's bias to believe events is clearly evident in these findings (Vrij, 2008). Support for the idea that descriptions of believed events set in the future can be correctly identified on the basis of plausibility is not supported on the basis of these results.

8.4 i Drawings as a tool to detect belief or deception. Two of three methods of potentially finding hallmarks of belief in occurrence in future events have been discussed: 1. Judgements of the content of transcripts of descriptions of believed events compared to fictitious events (studies 1b and d). 2. The evidence that intention can be shown to operate as a mnemonic (study 2). The third method examined was the use of drawings (studies 4 and 5). Previous research has suggested that drawings may be a useful tool to detect deception or to elicit information in police interviews (Mac Giolla et al., 2017). These authors set out arguments to support the use of drawings as a complement to other methods during investigations. These include the observation that drawings can help to overcome language barriers during interviews, on the basis that they can and already are being used in interviews with asylum seekers and during interviews with sources or informants in intelligence settings (Vrij et al., 2018). Other advantages include the fact that drawings are convenient and easy to implement in research (and in the field) and that the use of drawings is popular with police officers.

To illustrate this, two recent studies are described during which police were trained in ten innovative protocols for use in the detection of deception, one being the use of drawings (Vrij, Leal, Mann, Vernham, & Brankaert, 2015; Vrij, Mann, Leal, Vernham, & Vaughan, 2016). Results

showed that police officers preferred to use drawings over all of the nine other methods, although the discriminant ability of this method when used in these studies with mock suspects (i.e. cases in which ground truth was known) was not reported. Another recent study investigated methods by which police use statement inconsistency as a means to detect deception during interviews (Deep, Vrij, Hope, Mann, Granhag & Strömwall, 2018). When police officers were asked to explain how they had used inconsistency in drawings to determine whether the suspect was lying or not, 68% of officers said they had done so on at least one occasion. The reasons they gave (with percentage of respondents who endorsed each statement) were: correspondence between drawing and verbal statement (44%); correspondence between drawing and evidence (33%); improbable positioning of items within the drawing (14%); unwillingness/inability of the suspect to draw or complete the drawing (11%); other (14%). Thus drawings are already being used in the field and are popular with professionals whose job it is to obtain fair and reliable evidence.

In study 4c, a range of methods taken from previous research on the use of drawings to detect deception was applied to drawings of real and fictitious (but not lied-about) events set two weeks around the present. These can be summarised as plausibility, detail and visual perspective, counts of the number of bystanders and estimates of the level of detail in which the bystanders are drawn (Mac Giolla et al., 2017; Vrij et al., 2012). The drawings derived from study 4b were of plausible personal events that varied only by temporal direction (past/future) and belief in occurrence (believed, fictitious). If these variables can distinguish real from imagined events, such findings would provide evidence of hallmarks of veridical belief in past and future events. Note that the senders of the drawings had rated their subjective experience of simulating these events for one minute, with eyes closed. Believed events received higher self-ratings on indices of location, spatial layout of people and objects and visual details. However judgements of features found to be reliable in published research

on the use of drawings to detect deception (about past events) were not valid or applicable to study 4 believed/not believed drawings (Vrij et al., 2010).

There was no difference in the number of bystanders in the drawings. Ratings on the level of detail in which bystanders were drawn did not form a reliable scale. Raters' comments on bystander decisions showed that they had developed different criteria to decide which figure was the central actor (the sender) and which were the bystanders in each drawing. Were such methods to be used in applied settings, it would be important to establish the identity of the central figure before such judgements could be made. Plausibility ratings were made using a definition taken from previous research (*I can imagine the sender being in this place*). Since there was no reliability between raters on what constituted plausibility in the drawings, this suggests that this definition is not eliciting any type of clear judgment, let alone one that encapsulates plausibility. Reliability could not be established for detail or the viewpoint from which the drawings were depicted. It is notable that the similar experimental design used in study 1b, which employed comparable cues to elicit verbal (rather than pictorial) descriptions of similar events, yielded content in text form. In study 1d, detail ratings formed a reliable scale, on the basis of which detail was perceived by judges to be higher in believed past (but not future) events. This suggests that drawings are not adding a useful measure on which to check consistency or supplement existing methods of assessing veridical belief in past or future events. Nor are they verified as a useful or accurate tool. On this basis, it seems unlikely that drawings are a good addition to an investigator's toolkit when applied to identify deceptive content. This was tested in study 5b.

The final experiment in this thesis was the only study directly to contrast truth with lies about an event set in the future. Participants completed a range of measures during a surprise interview before the planned activity

could be carried out. To my knowledge, only one other study has been published that reports discrimination of truth tellers and liars by drawings made during a future-oriented deception study (Calderon et al., 2018). The dimensions rated related to construal theory (Trope & Liberman, 2010). Results showed that liars' drawings were more abstract and truth-tellers were more concrete when rated by 117 judges in an online presentation of the material. The examination of drawings using methods employed in previous research, some of which were tested in study 4c, was carried out on drawings made in study 5. Two judges viewed all drawings and counted the number of bystanders present in each scene. Three new judges rated detail, plausibility, visual perspective and the presence or absence of a critical item that had been stated in an interview to be the object that was central to what the drawing depicted. Thus this last question provided an opportunity to verify consistency between the statement and the drawing.

Judges did not agree on visual perspective and nor could they agree on whether the critical item was shown in the drawing. Police officers' use of drawings as a means by which to clarify statement inconsistency does not seem to be supported by this finding. However judges did agree on what constituted plausibility and detail in drawings and their ratings were used to compute a variable that showed that truth tellers' drawings were more detailed but were not more plausible. Judges agreed on the number of bystanders in each drawing but this did not vary between true and deceptive drawings.

These results suggest that plausibility is not a reliable construct when applied to believed (real) events (study 4c). Even when plausibility judgments formed a reliable scale, this could not discriminate truth from lies in drawings (study 5b). Study 5b did show that judgements of detail in drawings of a future event were reliable and were higher in drawings made by truth tellers compared to liars. To examine this finding further, future

research might address the issue of whether ratings for proficiency of drawings can also index true or believed events from not believed or lied-about events. Before drawings can be used as reliable estimators of the content of witness and suspects statements, better understanding of what is being rated and the impact of drawing coherence or skill should be addressed.

Reliability of judgements in these studies was more stringently assessed than in some previous literature examining deception detection about future events. Nevertheless, the evidence that drawings are reliable means by which to detect hallmarks of truth is not supported by the research in this thesis. Nearly all measures used in previously published research were unreliable. Or, when they were reliable, they did not identify or discriminate hallmarks of real events. There were no differences in self-rated phenomenology of prospection in study 5a. Without a control condition to contrast the truth and lie conditions, it is not possible conclusively to state that these participants were not using episodic future thinking. Thus comparison between this study and study 4c may not be supported. As participants in study 4c did report variance in mental time travel on the basis of belief and time, and drawings were not able to reflect these differences, it seems unlikely that drawings are a reliable means by which to index belief or truth.

8.5 Avenues for future research

Whether thinking about the past or the future, travelling in time engages processes that are generative, associative and easily prone to errors. Recently a friend was telling me about watching a kite surfer landing on a beach this summer before tailing off mid-sentence. He had just realised that the scene he had been describing was in fact a video he had seen on the graphic screen of a treadmill at the gym. Psychologists have long known that this type of error can be explained by source confusion (Johnson, Hashtroudi, & Lindsay, 1993). Memories and thoughts about the

future are integral to the maintenance of the sense of self across time, an important constituent of wellbeing, but are inherently error-prone systems (MacLeod, 2017). Determining the reliability of memory is not an innate, common-sense skill (Akhtar et al., 2018). The research in the thesis has followed two main strands to examine how individuals endorse events in the past and in the future on the basis of belief in occurrence.

The first strand in the thesis goes some way to answering a call to examine the impact of belief in occurrence on the architecture of memory and episodic future thinking (D'Argembeau, 2016; Ernst & D'Argembeau, 2017; Lehner & D'Argembeau, 2016). Future directions for this research would be to examine the relationship between belief, autonoesis, and perceptual and contextual components of mental time travel (Rubin et al., 2003). There is evidence that scene construction and personal significance contribute to the maintenance of a sense of self and identity across time (D'Argembeau, 2016; D'Argembeau & Van der Linden, 2012). Relatively little is known about the relationship between autonoesis and the architecture of prospection (Klein, 2016). In particular, results in the thesis suggest further investigation of whether the mental time travel and pre-experiencing components of autonoesis are differentiated by temporal direction and goal-relatedness. The relative contribution of semantic and episodic memory to these processes could be investigated by applying autobiographical interview coding to transcripts. The architecture of the anticipated future could be examined from developmental, clinical or neuropsychological perspectives.

Thinking about the future is essential to psychological wellbeing and goal attainment but this capacity is subject to variance in certain populations or circumstances (MacLeod, 2017). Hypothetical thinking about possible futures and possible selves that may never happen is part of the processing that enables a coherent sense of self (D'Argembeau et al., 2012; Hamilton & Cole, 2017; Lardi et al., 2010; Markus & Nurius, 1986). It

would be interesting to extend this research to populations who experience a reduced or discontinuous experience of coherent identity across time. Hypothetically this might occur through a number of processes such as complicated grief, experience of migration, gender change, acquired brain injury, trauma, or illness. Perceived changes in identity and self direction can lead to derailment, the sense that the you are not living the life that you were expecting (Burrow, Hill, Ratner, & Fuller-Rowell, 2018). Studies 1, 3 and 4 of this thesis might be extended to address the relationship between derailment and cognition, expectancies, goals and prospection (Ratner, Mendle, Burrow & Thoemmes, 2018).

Study 3 showed that prospection for goals and plans was similarly vivid, so that the impact of belief in occurrence made these events highly accessible and vivid. The example given in the introduction of Hilary Clinton confusing an imagined future event as an experienced memory shows how vivid plans might lead to errors in cognition. The associative nature of future thinking may lead to a liberal bias for associative thinking with a correspondent reduction in accuracy and this may have adaptive benefits (Dewhurst et al., 2016; 2018; Schacter, Guerin & St Jacques, 2011). Extending study 2 to examine the impact of belief in occurrence on future-oriented encoding measured by correct recall and susceptibility to lures is one direction for future studies.

A detailed critique of the reliability of drawings as a tool to detect true intention and possible means by which to test reliability has been outlined in this chapter. Further research to identify whether drawings are a reliable index of intention and belief in occurrence is needed before such tools should be applied. In particular, the relationship between drawing proficiency and coherence of the scene depicted would be a suggested next step. The constituent components of what constitutes plausibility when judging the content of written or pictorial evidence is particularly of interest. The reliability of this method of interpersonal reality monitoring

(Johnson et al., 1998) should be established before these methods are employed in the field as investigative tools.

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Appendices

Appendix A

Table A.1: *Study 1(a). Events generated in Phase 1 and Phase 2*

Theme	*Past (Phase 2)*	*Future (Phase 1)*
1. Occupation		
1.1a Meeting (study or work)	My internship review with my manager	Society meeting
	Had a lunch meeting with my Director to discuss future plans for the charity	Have a meeting with my supervisor from uni
	Had supervision and talked about a disagreement with a work colleague	Have a meeting with my department
	Had a dissertation meeting concerning a change in chapter structure	Meeting at work due to it closing
	Had a committee meeting for a project I volunteer for	Lab meeting with tutor
	Had coffee with my colleague and had a meeting there	Have an Individual Development Meeting with my boss
	The meeting where I was told I was getting promoted at work to a full time position	2 hour meeting about planning this years dance4life National School Workshop Tour
	Had a meeting with a reader and discussed my first draft of a novel.	One hour fundraising task force meeting
	Had six-monthly progress meeting at work	Schedule meeting for work to discuss releases etc.
	Had a meeting with my boss and he reviewed my performance	Meet Sean to discuss script
	–	Doing a presentation at my company on the research I've been doing on studies into 'the art of communication' -

		methods of communicating complex information in the most user-friendly manner.
1.1b Working	Performed at a comedy gig in Aberdeen which took 3 hours to get to and from	Going to work for 8 hours this week.
	Went on a training course for how to manage volunteers	Go to work at Druckers.
	Took part in a video conference regarding asthma treatment	Write an article for a website
	Gave my departmental presentation for 2010	11-5 work at scummy Greggs
	Worked on new film footage which I filmed at the weekend	Volunteer at Southover Primary School on Monday afternoons
	Babysat Oliver on my road in the evening	Going to work
	Worked a night shift with an extra resident in the house to normal	Finish typing up Haifa piece
	Working on QM project with project group	Redraft blog
	Worked at the gallery in Old Street	Voluntary work
1.1c Job hunting	Met my friend's mum Caroline for help with my personal statement	Job interview
	Had a job interview at a charity organisation	Calling the NHS recruitment to find out when my new job starts
	Jobseeker's interview in Streatham	–
	Filled out an application for a vacation scheme	
	Had a job interview in Troon	
	Applied for a job in Germany and they called me for an interview	
	Applied for a job in Milan but they didn't call me for an	

	interview Went to a job interview at Guys Hospital	
1.2 Studying		
1.2a Studying	Tried to choose my optional courses for the coming semester as part of my MSc degree in Economics	Going to the library with a friend to assist in a dissertation
	Spent a few hours finishing off my dissertation	Work on IS report.
	Attended a SIRE seminar in Edinburgh	Study group in the library everyday
	Did some reading on deprivation and antisocial behaviour for my course	A lecture
	Looked up journal articles related to the determinants of energy demand	Group study trips to the library
	Attended several hours of lectures on Microeconomics, Macroeconomics and Econometrics	Finish coursework assignment
	Attended Law-related workshops	Going to the library to work
	Came into college to read for my proposal last Monday	Organise timetable and readings for next term
	Went to the library to work on dissertation and essays with uni friend	–
	Attended a one-day workshop in the uni	
	Did some reading on deprivation and antisocial behaviour for my course	
	Went to the British library to work on dissertation	
1.2b Exams	–	Have an English exam Prepare for examinations. J

		agreed Do the two examinations. 2 exams Then I have an exam next week Then I have exam, exam exam in two weeks!
2. Leisure		
2.1 Going out		
2.1a Meeting for a coffee	Met up with friends for coffee	Meeting friends for coffee (couple of times)
	Met up with housemate at a Turkish cafe for her to meet some university mates	Going for a coffee (twice)
	Had coffee and a chat with the girls after college last Thursday	Tomorrow I am meeting a friend for coffee at Starbucks around lunch time
	Met another boy for coffee	–
2.1b Meet a friend in a pub or bar	Met up with my housemate and a friend to go for some drinks at the weekend	Going to the pub tonight to watch the Manchester City football match
	Went to the pub for my friends birthday and had dinner and drinks	Going for drinks on Saturday when all of my housemates are back after Christmas
	Went to a late bar and danced	Dinner out at a pub
	Gone to the pub with my university friends	Go to the pub with friends
	Going to Brighton to see some friends for a night out (less than 24 hours)	Ian 7pm White Hart
	Had drinks on Saturday night	Drinks with friends in the pub
	Meeting a friend for a drink to celebrate his new job	Catch up with friends at the pub
\	Met my Dad and his girlfriend for drinks in a wine bar and ate some cheese	Going for a drink with a colleague after work
	Went to the pub with the owner	Going out for drinks with my

	of the pharmacy I was working in	godfather
	Went to a pub with a friend and drank too many cocktails	Meet an old work friend for drink and catch up
	Went to the pub for a few drinks with a friend and did the pub quiz	Going to the pub to watch whichever football match is on
	Going to visit friends in london (pub)	Going to the pub with my two friends Dom and Ruth
	Met up with friends from back home	Go to the pub
	Went to my friends 30th birthday party in a bar	–
	Going to visit friends in london (at a different pub)	
	Went to the Washington for my birthday	
	Went for a walk to the pub to watch the football yesterday	
	Been to the pub to watch United-Arsenal match	
2.1c Eating out	Went out for meal	Lunch with course mates
	Going for dinner at international starters	Going for Sunday dinner with my boyfriend and parents
	Went to a Japanese restaurant in Soho with university friends to experience it	Have lunch with an old uni mate who is in London for the weekend
	Had lunch with housemates on Park Street	Meet my mum for dinner
	Going to Nando's for lunch with my colleagues/friends	Going for dinner with a friend I don't like
	Went to an African restaurant	Taking my girlfriend for dinner next Saturday
	Attended my dad's 54th birthday at his house and ate Chinese takeaway	Meeting with friends for dinner (probably **four** times in the next two weeks)
	Went to an Italian restaurant	–

with my family
Had dinner - roast pork - with my parents
Going to Cheltenham with my girlfriend and going out to a restaurant (restaurant part was less than 24 hours)
Had dinner with friends for my friend Rahul's 21st birthday
Had lunch with 11 other PhD students at an Italian restaurant
Been out for a meal to Rare, Norwich
Met a boy I've been seeing for Sunday lunch
Met a friend for lunch at the Photographers' Gallery
Went out for lunch with the new PhD students to welcome them
Had a very good and filling barbecue
Going out to dinner with my mum as she was in London for the day
Going for dinner with a friend at Tangs sushi restaurant before she goes to Switzerland
Went to a restaurant for dinner with friends
Treated my girlfriend to a meal
Went to dinner in Wimbledon with a high school friend who recently arrived in London
Went to dinner at an Indian restaurant with work colleagues
Went to dinner at an Italian restaurant with my boyfriend to meet his family friends for the

	first time Eaten at Thai restaurant for friend's birthday Eaten worst meal ever at a curry house with workmates Attending Burns supper at my friend's parents' house	
2.1d Go to a club or specific event	Attended a pop-punk night at Corporation, Sheffield	Going to a club with friends
	Went to a comedy club	Going to a club
	Went on a night out in Ashby	Go to a club on Thursday
	Going out for my friends birthday in Central London	Go to a burlesque club night on Saturday for my friend's birthday
	Gone to Glasgow for an epic night out at the West End with my mates	Getting pissed/going out
	Went dancing at a nightclub	Evening out at really lame student night
	Went to a night in Bournemouth with friend Bee	Going clubbing with a friend
	Went out with my friends in a nightclub called Chasers on Saturday night	Meeting my friend Alice in Manchester for drinks, food, dancing, cinema
	Had one big gathering for a night out	Friends from Ashby, Leeds and Preston are coming to my house in Sheffield. We going to have a take away and go to few bars then clubbing in Sheffield (this is going to be a messy night!)
2.1e Live music	Been to a gig in Birmingham with friends	Go to watch some live music at local pub with some mates
	Went to a gig to see a friends band	Going to music nights (a few times in two weeks)

	Went to see a friend's band playing in a pub	Go to see Brand New at Wembley on the 23rd
2.1f Cinema	Watching *Avatar 3D* at the cinema with friend	Go to the cinema
	Went to the cinema to watch *Avatar*	Go to the cinema (iMAX) to see *Avatar*
	Went to the cinema to see *It's Complicated*	Going to the cinema
	Went to the cinema to see *Avatar*	Meal/cinema with a friend from work in London
	Saw a film at the cinema in Birmingham	Go to the movies with friends
	Watched *No Country for Old Men*	Orange Wednesday film night
	Attended a screening of *The Quatermass Xperiment* (1955)	Saturday I am going to see *9* with my Girlfriend
	Watched *The History Boys*	Cinema
	Watched *Avatar* at cinema	Seeing *Avatar* with Heather
	Went to the movie *Up in the Air* with my boyfriend	Going to see Avatar with my friend Robin and a few other friends
	Went to cinema	Watch film at IMAX
	Watched latest *Final Destination 3D* on Blu-ray with useless 3D glasses	–
	Went to an art house cinema to attend a screening of classic black and white horror movies: *Nosferatu*, *Dracula*, *Frankenstein* and *The Wolf Man*	
2.1g Party	Been to a house party	Cathryn's birthday meal
	Went to the opening of the exhibition Eberhard Haverkost: RETINA at the Schirn Kunsthalle Frankfurt.	Go to a friend's birthday party

	Celebrated Australia Day for the first time	Go to a roller disco for a friend's birthday
	Went to a house warming party	Going to a house party
	–	Celebrate Rebecca's birthday
2.1h Theatre	_	Cheap student theatre tickets
		LastMinute.com Theatre tickets
		Othello with Patrick
2.1i Museums & galleries	Went to the Tate with some friends	Museums, especially free ones
	Visited a medieval torture museum to do research on torture techniques for a script	Museum
2.1j Other going out	Had my first ever visit to a casino	Go to a football game
	Walked up Carlton Hill in order to admire the amazing view	Meet Anthony in Trafalgar Square
	Went to the football and watched Partick Thistle lose to Dunfermline	–
	Been to bingo at Mecca with 4 friends, didn't win anything!	
	Walked with friend's brother to school	
	Met my ex boyfriend - last time I saw him was 1.5 years ago	
	Walked friend's dog across Wandsworth Common	
	Went bowling with friends	
	Going for a walk up Arthur's Seat with friend after class	
2.2 Staying in		
2.2a Going to a friend's house	Visited friends I hadn't seen for a while and spent a whole afternoon chatting and laughing even though I had an important deadline the next day.	Going to a friend's house to watch a film
	Watching *The Incredibles* at boyfriend's house	Going over a friends house to watch your favourite TV

		programme
	Visited a couple's new house	Go round to a friend's for dinner
	Had tea and scones with friends and their new baby	Going round to my friend Nancy's house to watch a film with her and see her family
	Went to Milan to see friends and stayed at their place for one night	Going to a mates house to play Pro Evo Soccer (Xbox game), and general banter
	Went to a friend's studio to help him pick out sculptures for a show.	–
	Been for a meal at a friend's house	
2.2b Staying in	Cooked pizza for my sister and her boyfriend	Watch *The Wire*
	Watched a James Bond film while waiting for a fridge to be picked up from my parent's house	Do some DJ-ing
	Cooked a nice meal for my partner	Pizza and a movie in with my housemate
	Watched Murray v. Nadal with my dad	Read my book
	Watched Manchester United thrash Manchester City in the Carling Cup Semi-Final	Share a bottle of wine with my boyfriend after the job interview
	Watched Eastenders while starting my crochet	Prepare a meal
	Listening to the new Ricky Gervais podcast that lasted for 50 minutes	Browse the internet
	Had my friend round to my flat for dinner	Play computer games
	Wrote and recorded a song	Watch TV
	Watched the DVD of *Star Wars: The Empire Strikes Back* for the first time	Watch *Match of the Day* on TV

	Watched a Leicester City match on TV Managed to have a go on the XBOX without the baby waking up Went on my Wii Fit Watched a TV programme the wife wanted to watch, only she fell asleep five minutes in. Started painting a canvas in readiness for it becoming someone's valentine's present. I am copying a web comic called *xkcd* Sat in bed on my computer on my morning off work Had a morning off work and stayed in bed until 12 Called my friend Jessie who lives in Germany Spending hours procrastinating on YouTube	_
2.3 Other Leisure		
2.3a Sports	Played tennis with my girlfriend	Playing cards or basketball with fellow students during lunch when in college time.
	Attended a yoga class with two of my house mates	I have go karting with some friends next week
	Going for a run	Go to the gym
	Played a game of volleyball	Go for a walk
	Went to a yoga class to try it out	Kick boxing lessons once a week
	Been swimming and done 40 lengths	General gyming/swimming every other day with siblings/friends
	Went to the gym and lifted some weights and run 8k on the treadmill	Going to the gym/swimming,

	Played a league match in a Sunday football league	Fitness class
	Went to the gym and it was really busy!	Jogging with friends
	Going to the gym	Sports: five-a-side, squash, ice skating, swimming
	Played a friendly game of 5-a-side football	Go for a run
	Went to the gym and went on the running machine, cross trainer and did some weights and sit ups	Go to the gym
	Went walking in the country with best friend and her new baby	Well without a doubt tonight I am going Salsa Dancing
	Had a gym session and ran 10km	Playing football with friends and other students at Brighton and Sussex.
	Played Snooker, making a break of 36	Going to the gym at the weekend
	Having my gym induction	I play basketball 2/3 times a week
	Went to the gym for pole dancing class last Monday	Go for a swim
	Went to the gym with my friend, considered joining because the swimming pool looked lovely	–
2.3b Shopping	Spent ages trying to find a suitable gift for my brother's birthday	Take these friends shopping in the centre of Sheffield and Meadowhall
	Went to the market and bought a joint of pork belly	Shopping with a friend
	Went shopping with my mum to pick up my dress for the ball last Saturday week	Go in to town to buy fish for new fish tank
	Went to the shops and got a smoothie	Go shopping for underwear

	Ordered an office chair online	Shopping
	Shopping with friends	Go shopping with two of my friends tomorrow
	Bought new glasses	Go shopping for birthday presents
	Went grocery shopping	Shopping next Wednesday at Armani
	Shopping in Sainsbury's for golden syrup to make cookies	Going shopping with my cousin
	Went shopping with my BF to buy a new extra comfy couch.	Go buy Rebecca stuff for upcoming birthday
	Went shopping in Kingston with a University friend to look for a baby gift	Going to a second hand bookshop and choosing a new book
	Been shopping for friend's birthday present	Car boot sale
	Went to a supermarket in another city	Visit a car boot sale
	Went shopping for a new pair of work trousers	–
	Been to ASDA to do a big shop	
	Went shopping and bought a black bag cause I needed it it	
	Went to the supermarket to buy ingredients to bake a cake	
2.3c Travel & day trips	Went for a bike ride in the country	Trip to the Malverns for boyfriend's photography project.
	Visited Stephansdom monument in Vienna	Get a train to Manchester
	Went to the beach in Bournemouth with my friend Bee	Going home for the weekend after exams with a friend
	Going to Glasgow with friends to visit Ashton Lane	Flying to Portugal to visit my parents
	Went to Greenwich market for the first time to get out of the house at the weekend	Then I am going Amsterdam on the 5th of February (Zurich a week after that)

	Walked round the grounds of Stornoway Castle	Getting the train back to Manchester
	Took a flight to Cardiff	A trip to Southend on Sea
	Biked home from Stoke Newington	Train to Felixstowe after work
	Day trip to Cambridge to see a friend who is going travelling	–
	Flew back from Italy after the Christmas break	
	Went skiing near the Alpes	
	Took a Train from Dunlop to Glasgow	
	Took a flight to Stornoway	
	Sat in traffic for two hours trying to get home through snow	
	Waking up late and having to run for the train and missing it	
	Got the Eurostar back from Paris and enjoyed eating my ham and cheese sandwich	
	Got the train to work and was disheartened when I realised someone was sat in MY SEAT.	
	Drove to Birmingham with friends	
	Tried a new route home	
	Drove my car to pick up my boyfriend yesterday	
	Walked home from work with my colleague	
2.3d Seeing family	Meeting my new baby cousin Lois for the first time at my uncle's house	Celebrating my grandma's 90th birthday at her house
	Dinner at my Nan's house	Go home and see family
	Babysat my sister Roya after school	Meet my mum for dinner

	Visited my brother for his birthday	Spending time with family who are popping down
	Visited Nan and Grandad for lunch	Visit my family
	Visited my Grandparents, and saw my Gran's sister for the first time in a decade	Visiting relatives/parents
	Spent some time with my boyfriend's nephews and nieces last friday	Go to see Grandfolks
	Walked along the canal at Maryhill with my dad for the first time	–
	Went to my aunt and uncles' house for a roast chicken lunch	
	Been for a meal at my parent's house	
3. Life Management		
3.1 Flat hunting	Viewed a flat in London	Viewing of a flat in North London
	Viewed a house with my boyfriend	Going to Hampstead to look in newsagents windows for places to live
	Looking round a flat in Brockley	–
	Went to house viewings to choose a flat to move into	
3.2 Domestic chores	Cooked Swedish meatballs from scratch	Go food shopping
	Vacuumed my new car for the first time	Doing the laundry
	Tried to perfect a new recipe for my famous ricotta pasta sauce	Organise my iTunes
	Done a whites wash for the first time in ages	Vacuum whole house
	Had a big clearout in my flat	Drop off trousers at tailors
	Taken my bike to be fixed	Prepare a meal
	Baked three loaves of bread,	Make a chicken stew for the

	replaced the honey with sugar	first time
	Repaired the finish on my guitar	Sorting out my utility cupboard
	Packed my things preparing to move house	–
	Made noodles for dinner, experimented with chicken gravy granules and sweet and sour sauce ... it turned out quite well	
	Had a long conversation with O2 about iPhone	
	Wiped iPod & only reloaded the stuff I actually listen to/watch	
3.3 Financial chores	Filed my tax return for this year	Paying bills
	Got a text from my bank and realised I had more money than first thought, have been trying to spend it ever since	Going to the bank
	–	Signing on (Jobseekers' Allowance)
		Phone council about tax stuff
3.4 Grooming and healthcare	Went to the hospital to get a blood test done last Friday	Arrange a doctors appointment about quitting smoking and then attend it
	Set a date to quit smoking	Getting my hair highlighted
	Went to the hairdressers with a friend	Get my hair cut
	Got my hair done in Ruben's Hairdressers last Saturday	Buy a hair colour and colour my hair at home
	Had a haircut on cheap trial deal	Have a meeting with my GP
	Went to see my psychologist and this was my last appointment with her	Giving myself a manipedi
	Got my haircut at the hairdressers on my street for the first time	Getting my hair cut

	Went to the massage parlour and accidentally ran into a potential new editor who was pretty much naked at that time. Had a haircut	–
3.5 Event planning	Visited a Gallery where I am holding an event in Feb	Organising my birthday dinner
	Looked online at summer holiday destinations	Booking festival tickets
	–	Meeting with two friends to plan for some events we are starting Planning for friends to come round for a meal
4. Idiosyncratic (past only)	Went to unlock my car door and the locks had frozen Started stripping an old tractor Spoke to a really old man on the phone who claimed he knew John Lennon Was excited to find half a bag of Malteasers in my bag Spent almost an entire day drawing Got presents from my friends for my birthday	–

Appendix B

Study 1(b) Questionnaire

PHENOMENOLOGICAL CHARACTERISTICS QUESTIONNAIRE

Participant number:	Practice/Experimental Trial 1 2 3 4	Past / Future

Instructions

Below is a list of questions about the characteristics associated with your remembered/ imagined past and future events. Circle only one response. Please answer honestly. Your answers are confidential. Remember, at no point should you tell the experimenter which events were true or invented but please make sure that you indicate this at question 18.

	Please indicate how much you agree with each statement by choosing a response between 1 (not at all true) and 7 (completely true)	**Response**						
		Not at all						Completely
1	While remembering/imagining the event, I feel as though I am reliving/experiencing it	1	2	3	4	5	6	7
2	While remembering/imagining the event, I feel that I travel back/ forward to the time when it happened/ would happen	1	2	3	4	5	6	7
3	My memory/representation for this event involves visual details	1	2	3	4	5	6	7
4	My memory/representation for this event involves sounds	1	2	3	4	5	6	7
5	My memory/representation for this event involves smells/tastes	1	2	3	4	5	6	7
6	My memory/representation for the location where the event takes place is clear	1	2	3	4	5	6	7
7	The relative spatial arrangement of objects in my memory/representation for the event is clear	1	2	3	4	5	6	7
8	The relative spatial arrangement of people in my memory/representation for the event is clear	1	2	3	4	5	6	7
9	My memory/representation for the time of day when the event takes place is clear	1	2	3	4	5	6	7
10	While remembering/imagining the event, I feel the emotions I felt when the event occurred/would feel if the event occurred	1	2	3	4	5	6	7
11	The emotions I have when I recall the episode are 1=extremely negative; 7=extremely positive).	1	2	3	4	5	6	7
12	This event is important to me (it involves an important theme or episode in my life)	1	2	3	4	5	6	7
13	While remembering/imagining the event, it comes to me in words	1	2	3	4	5	6	7
14	While remembering/imagining the event, it comes to me as a coherent story and not as an isolated scene	1	2	3	4	5	6	7
15	When I recall the event, I primarily see what happened from a perspective as seen through (1= my own eyes; 7=an observer's eyes).	1	2	3	4	5	6	7
16	How desirable was this event? (1=would not want to do it at all; 7=highly desirable)	1	2	3	4	5	6	7
17	How many days from today is the event in the past/future? (write number of days)							

Hand this sheet to experimenter, continue onto next page

PHENOMENOLOGICAL CHARACTERISTICS QUESTIONNAIRE
PAGE 2

Participant number:		**Practice/Experimental Trial**						**1 2 3 4**
		Please circle one response						
18	This simulation was…	**Past True**		**Past False**		**Future True**		**Future False**
		An event that has happened in the last two weeks		An event that has not happened to me in the last two weeks		An event that I genuinely anticipate happening in the near future		An event that I do not foresee happening in the next two weeks
	Please indicate how much you agree with each statement by choosing a response between 1 and 7	**Response**						
		Not at all						Completely
19	PAST EVENTS ONLY I believe that the event really took place the way I remember it in the past two weeks and I did not imagine or invent anything that did not take place in the last two weeks (1 = 100% fantasy; 7 = 100% real).	1	2	3	4	5	6	7
20	FUTURE EVENTS ONLY Right now, I believe that the imagined event really will take place as I imagined it in the next two weeks. I did not imagine or invent anything that I do not think will take place in the next two weeks. (1 = not at all likely; 7 = completely likely).	1	2	3	4	5	6	7
21	How motivated were you to perform well in this task? (1 = not at all; 7 = highly motivated)	1	2	3	4	5	6	7
22	How difficult did you find the task? (1 = not at all; 7 = extremely difficult)	1	2	3	4	5	6	7

Thank you for completing this questionnaire. Remember, at no point should you tell the experimenter which events were true or invented but please check that you have indicated this in your response to question 18.

NOW PLACE THIS SHEET INSIDE THE ENVELOPE WITHOUT SHOWING IT TO THE EXPERIMENTER!

Appendix C

Study 1(b). Protocol used to clarify episodic memory, imagining and episodic future thinking with participants

Clarifying Episodic Memory and Episodic Future Thinking

Episodic memory is memory for specific events that you have personally experienced and which you have a feeling of re-experiencing when you remember them. For example, if I asked you to recall an episodic memory for the words 'birthday party' you might remember a party you went to recently or maybe your own last birthday celebration. These were events that you attended and your memory of them involves more than just facts, you may also remember whether the food that you ate at the party was nice or whether you liked what you were wearing that night – subjective personal details about the event that only you could have known at the time and which you may also be able to re-experience when you try to remember that event.

To show me that you understand what I mean by episodic memory, please give me an example of episodic memory for the cue "going for a job interview"

Episodic future thinking occurs when we project ourselves into the future to mentally pre-experience a specific event or experience that has yet to happen. You are probably familiar with the idea of episodic memory but less familiar with episodic future thinking. To clarify what I mean, consider the question: *will you want to go clubbing on your 40th birthday*? To answer this you have to imagine yourself aged 39 and you will have an accompanying sense that your preferences at that age will be a bit different to those you have now. You may even have insight into how you are likely to feel at 39 and whether clubbing sounds like a good night out to your 39-year-old self! Now consider the semantic future question: *will Egham have a Disneyland in 2050*? To answer this you are still thinking about the future but you do not have an accompanying subjective sense of personal experience. Hopefully you can see the difference, if not, please ask me to clarify this. Here's another example, do you think you will want

to share a hotel room with your mother on holiday this year? You are using future episodic thinking whenever you direct your thoughts towards events that may happen in the future to see how they feel and how you might want to better plan or organise that activity. You will most likely use any relevant life experience of the event or activity as well as knowledge of yourself, what feels right for you, to help you when you are engaging in future episodic thinking.

To show me that you understand what I mean by episodic future thinking, please give me an example of EFT for the cue "attending a birthday party".

Instructions for the practice trials

Episodic memory is memory for one-time events that you have personally experienced and which you have a feeling of re-experiencing when you remember them.

Episodic future thinking is projecting yourself into the future to mentally pre-experience a one-time event that has yet to happen.

Practice scenario A Going out for a meal with family or friends
Practice scenario B Going shopping for a specific item (a certain ingredient, a new shirt, a birthday present for a friend: any specific item of your choice).

1. Choose one scenario (A or B) to simulate as a past experience (you have done this in the last two weeks)

2. Choose one scenario (A or B) to simulate as a future experience (you are planning to do this sometime in the next two weeks).

3. Let me know when you have chosen which event you are going to practice as a memory and which one you are going to practice as a future thought.

Appendix D

Sample of transcripts from Study 1(b), rated in Study 1(c, d)

P26 T1 FUTURE

Erm, I'm going to, I'm having someone over on Thursday, I think it is, to, we're having dinner, I said I'd cook, not quite sure why, not very good at cooking, erm, think we'll just have like lasagne or Bolognese or something, cause its something that I know I can make taste okay [laugh], isn't hard to cook, erm, it's Zoe who's coming from another flat and I should think Eve from my flat will probably be there as well, cause she's friends with her as well, makes sense [laugh] erm [pause] erm, [pause], be in my kitchen in halls so there will probably be other people in and out as well [pause] making it harder to cook, there's eight people, don't really need to be cooking for another, [long pause] try it, [pause] Erm I haven't arranged anything more to do though, about times or anything, far too organised [laugh]. [pause] Erm, yeah. [pause] Can't think of anything else.

P26 T2 PAST

Last Tuesday myself and [pause], how many of us were, four girls, yeah, went to my friends flat in my same halls still, so I don't have to go far, to watch a film. We watched *Paranormal Activity*, which I've been wanting to watch for ages, I was going to go and see it at the Cinema but wussed out. [pause] Erm, [pause] It was, we had to sit in her room, which was nice and cosy, five of us, and she had the radiator on full blast and it was absolutely boiling anyway [short pause] Erm it watching on a tiny laptop screen [pause] Erm [pause] it was, it wasn't as scary as I thought it was going to be, however I think we did annoy a lot of her flatmates with occasional screaming [pause] Erm I had to sit on the chair, the office chair and all the rest were on the bed with the laptop [laugh] [pause] erm [pause] one of the girls that was with us was from Founders and we're in Wedderburn, she had to walk back through the woods on her own, I felt quite sorry for her, none of us offered to walk back with her cause we'd have to walk back on

our own [laugh] [pause] erm, we had ice cream as well, that was good, with cream, and chocolate [pause] Erm, yeah [pause]. Yeah.

P26 T3 FUTURE

At the weekend when I go home, erm, my friend [pause] who's still living at home, he hasn't, she went to university but she dropped out, is coming round for a coffee. Erm. She always has to do everything really early in the morning so she's coming round at like nine. Probably still be in my pyjamas [pause] erm. [pause] Though I'm sure there'll be other people wandering around my house, there generally is. There's always other peop-, loads of other people, wandering round my house. [pause] Erm. [pause] She doesn't drink coffee, so quite why she said she's going to come round for a coffee I don't know. She always brings disgusting tea-bags that smell, they're like, I call them hippy tea, I don't know what they are, but they smell horrible. Erm. [long pause] Hmm. [long pause] Just generally, I haven't seen her in ages, catch up, talk about nothing I should think for a good few hours. [laugh] Yeah.

P26 T4 PAST

Erm. At the weekend when my boyfriend was up from Cambridge, down from Cambridge, whatever it is, erm, went to the cinema. Can't remember what we went to see 'cause it was a film that he had to see. I didn't really enjoy it that much. Erm [pause] Erm, we had to go to Feltham instead of Staines because, he likes Cineworld not Vue. [pause] Erm. [pause] Which was good in some parts, it meant I got an ice-cream in from Burger King before we went in, one of their like McFlurry things, that isn't a McFlurry 'cause its not McDonalds. [pause] Erm. [pause] The cinema, the queue was absolutely huge to get a ticket. [pause] And they don't do student discount on a weekend, which upset me. [pause] Erm, we were in the tiniest screen though to actually watch the film, I'd never been in a screen that small. Erm [long pause] We arrived really early which is why I had

time to get my ice-cream, which was quite lucky I 'spose cause the queue was huge. [pause] Erm. [pause] Yeah, yeah [laugh].

****

KEY

T1 Future, Fictitious

T2 Past, Believed

T3 Future, Believed

T4 Past, Fictitious

****

Appendix E

Table E1: *Study 1(c)(d). Questionnaire Design and Order of Presentation*

Session	*Temporal*	*n Items*		
		Believed	Fictitious	Total
1	Past	38	44	82
2	Past	26	18	44
3	Future	24	28	52
4	Future	38	36	74
	Total	126	126	252

Appendix F

Table F.1 *1(c) Judges 1 and 2 Comments on Likelihood And Plausibility*

Past Events			
Likelihood		*Plausibility*	
J1 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Good description, realistic actions and setting	Very basic information (could have been made up)	Consistent names and locations	Incorrect information e.g. student discounts happen on weekends
Very specific details, thoughts and memories	Finishing story off too quickly	Person asks self a rhetorical question	Too many pauses, indistinguishable words and fillers e.g. *erm*
Logical flow	Inconsistent names and locations	Use of reasoning in language	Repetition of events
	Wrong names for locations	Lacks contradictions	Contradictions
	Incoherent		Wrong names
	Very brief descriptions (to the point)		Speaking in future tense
	Unsure on details		Too long or too short
	Repeating details		Incoherent
J2 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Gave reasons why they performed a particular action	Ambiguous (*someone* round for dinner) or unsure of dates	Events occurred as a result of previous events	Contradiction, e.g. performed a novel complex task but was very successful
Detailed descriptions: elaboration, content casts self in negative light	[indistinguishable] indicates lack of conviction in what they're saying	Things which are too crazy to be a lie	Posthoc statements unconvincingly qualifying what was said (*good laugh* at the gym?)
Unlikely to make up stories concerning ill health, especially with regard to family members	Disjointed story, vague or confusing facts	Said they can't remember some facts (honest?) or portrayed self in a negative light	Inconsistencies (Small movie theatre with 3D screens, collected a takeaway, vegetarian who buys chicken or pepperoni pizza)
Coherent narrative	Stating what they are about to say	Ramifications of actions were sequential and logical	Very short story, lack of elaboration and detail makes it hard to judge
Corrected self about facts	Stereotypical or schematic stories	Reason for a particular event occurring	Actions not what most people would usually have done or too formulaic
Describing smells	Statistical infrequency	Makes sense	Switching or confusing tenses
Conviction	Stammering		Long pauses

Future events

Likelihood		*Plausibility*	
J1 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Language: *will probably*, *anticipate*, *normally*	Inconsistent details of place and names	Language: basing future event on past experiences	Confusing tenses: *that's all I can remember*
Accurate times	Too detailed about a future event	Language: words such as *likely* and *probably*	Talking about future feelings
Using old facts	Too basic at times	Language like *last time we did this*	Predicting specific reactions to events e.g. *I will love it*
Realistic assumptions based on past events	Very vague details and assumptions		Predicting exactly what will happen
	Speaking in past tense: *that's what happened*		Predicting emotions and atmosphere of places but using wrong names e.g. *Madison*
	Phrases like *I will be* in regard to emotions		Too much detail not possible for a future event. The event sounds less plausible although it could be likely
	Mixing tenses		Incoherent

J2 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Giving a reason for the activity (e.g. external pressure)	Switching tenses, hesitant language e.g. I imagine, probably in the future, probably tomorrow	Follows a logical structure, because of XY this occurred	Switching tenses sounds like a past event is being recast as the future
Truthful facts sounds like a frequently occurring event	Schematic - plans to do this but does not know why they want to	Knows the area or date, provides verifiable details	How many people really make risottos weekly at this university?
Positive emotions predicted from event	Not that into the experience, would try and avoid it	Reoccurring event or commonly done activity	Ill but still had pizza and alcohol?
Knowing facts that influenced their decision-making process	Too much information suggests it already happened	Can't remember some details (honesty?)	Switching tenses e.g. talks about the future in the past tense
Self deprecating humour, easy going tone, not stilted	Negative tone or experiences associated with a past event	Shorter (not sure on this one)	Doesn't follow a logical structure
Recurring or regular event with detail	Previously bailed on event – may do again	Related to several areas in life	Very short and nondescript

Corrects self	Too short or unsure when occurring (no set plan)	Self-deprecating humour, emotion	Seeks validation
Fixed date	Poor reasoning or ambiguity		
	Laughter (nervous?)		

Table F.2: *Study 1(D) Judges 3 & 4 Comments on Likelihood And Plausibility*

Past Events			
Likelihood		*Plausibility*	
J3 *More likely*	*Less likely*	*More plausible*	*Less plausible*
More descriptive and the transcript is longer and more detailed	Sometimes events sound less likely if there is too much visual detail or emotion so it ends up sounding exaggerated and unrealistic.	When described events are normal and expected or if something is not normal or expected. The event seems more plausible if the person comments that it seemed strange to them	Over the top and exaggerated events. It seems like people are trying to make their story more exciting. Also when there is too little visual detail
J4 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Lots of precise detail	If they don't remember something they probably should	There are no details that contradict my knowledge (*e.g.* saying an event takes place at a stadium when I know it doesn't)	If the person contradicted themself
Future Events			
Likelihood		*Plausibility*	
J3 *More likely*	*Less likely*	*More plausible*	*Less plausible*
Specific details about the time and place of the intended event and who will be there. If spoken about in a future tense and with words that suggest it is definite for example "I will go" rather than "I might go" or "probably".	Speaking in past or present tense. Less detail about specific times, places and people and too much detail on sights, sounds, smells because the event has not occurred yet so these things should be difficult to describe, or made up in too much detail.	If events are expected or you have experienced them before and can relate to what is being described.	Anything unexpected or out of the ordinary is described.
Using a future tense. Past or present tense makes it sound like the event is being made up instead of anticipated.	Too much visual or emotional detail where it seems like the speaker has let their imagination run wild because they are making up the event	You as the reader can imagine yourself being there and everything described is as you would expect it.	Events sound less plausible if they are out of the ordinary.
Speaking in a future tense. The event	Lots of pauses or fillers made events	Events sound more plausible when they	Events sound less plausible

has not occurred yet so speaking about it in past or present tense gives the impression that it is only imagined and not actually intended.	sound less likely because no definite plans had been made for an event and the speaker was trying to make them up as they went along. These words allow more time to make up a reasonable story.	are things that you can imagine a typical student doing such as going to the Student Union or having progress meetings with tutors.	when they are unexpected or seem out of the ordinary.
Speaker talks about the event like it is definitely going to happen for example saying "we are going to" instead of using the words "probably" or "maybe".	Pauses and fillers seems like they are trying to think up an imagined event as they are going along rather than describing something actually planned.	Events sound more plausible if you can imagine yourself doing them .	Far too much detail where it seems like everything is exaggerated to make the story sound m ore interesting.
More specific details about things like times, places and who will be involved in the event.		Descriptions of visual details and feelings *etc*. and the description is fairly brief.	Too much visual detail or feeling seems more exaggerated and unrealistic.
J4 *More likely*	*Less likely*	*More plausible*	*Less plausible*
If it seems that the event is part of someone's routine (do it every Wednesday)	Events which don't seem like they have been planned	It sounds like they have been pre planned rather than spur of the moment	if the event is described as a last minute plan. No times or dates etc
An event described as a routine or has happened before "I always go on the weight machines first before the treadmill"	Using "I would go" (rather than I will be going or I am going. The former sounds like the person is describing an event that won't happen	If there is nothing unreasonable that happens in the event and it could be done by anyone	Outrageous description of event *e.g.* " I will be made princess for the day after flying to Paris for an hour"
The event involves a plan between a group of people	Events definitely seemed less likely if there were few details	Description of reasonable actions	Describing impossible actions

Appendix G

Table G1: *Study 3(a). 54 Personal Goals by Attainment in Months, Importance and Desirability*

Description	Time [a]	Imp[b]	Des[c]
Get a first in my current project	–	100	100
Be more organised in my home life	1	89	100
Be in a better habit of going on walks and being outside more.	2	85	95
Have a family reunion for Christmas	2	55	84
Get a 2:1 or higher grade in my dissertation	2	96	100
Be more confident and smooth in my cafe job	2	50	91
Complete my current creative university project in a way that exceeds previous projects	3	90	100
Complete my written dissertation to a high standard	4	75	90
Learn to cook properly and healthily	4-8	100	90
Retake my English A level and get a B or above	6	76	73
Aim to have more financial independence	6	88	88
Lose weight and get fit	6	80	100
Read as many books as possible	6	65	80
Succeed on my foundation course	7	100	100
Get regular assisting work before I graduate	8	98	100
Get into Cambridge University to study English	10	77	89
Have a successful relationship with my current partner	12	100	89
Try to be happier and be less hard on myself	12	100	86
Go travelling after I finish my Art Foundation Diploma	12	100	100
Keep fit - get fitter	12	89	89
Run a half marathon and get physically fitter	12	76	60
Convert to being a vegan	12	88	85
Gain enough confidence to perform at least once in front of an audience	12	60	85
Become more motivated about my degree course	12	89	70
Make and sell more earrings	12	68	61
Get a promotion within the next year	12	91	100
Complete my law degree and get a good grade	18	81	87
Be able to pay the bills and have savings	18	90	94
Take part in an archaeological dig	22	56	64
Learn to play the lute	24	53	60

Description	Time [a]	Imp[b]	Des[c]
Move away from home	24	71	100
Become fit and healthy	24	57	53
Share a flat with friends	26	82	92
Get a 2:1 or a first in my degree	30	77	82
Own my home by the end of 2019	36	100	100
Create a space or home for myself so that I feel totally content and comfortable in this year	36-48	80	80
Have a career in the creative industries	36-48	62	100
Create an art piece which gets hung in a gallery	48	60	100
Actively try to combat environmental damage	48	100	100
Have a successful career where I enjoy my job and feel happy about going into work every day	48	92	100
Be good at gardening and be able to identify plants	60	70	67
Create a better work environment for my studio, be more organised	60	50	70
Make a difference in terms of animal rights	60	99	52
Become an artist in my own right	60+	100	100
Be in a position where I can afford to do what I love, even if my source of income is not related to this (though it could be)	84	65	77
Be in a safe, loving relationship with someone who cares about what I care about	120	88	88
Go travelling in Asia/India	120	79	95
Raise a family	120	95	97
Organise a music and arts festival by the age of 29	120	100	100
Write a novel about my life	180	17	80
Look back on life without regrets and with memories of huge and varied experiences	840	74	97
Learn to drop things and make less of a big deal about small problems	Not sure	65	90
Be more socially secure and confident in group situations	Long time	96	100
Be less weird about sharing money	Long time	80	100
Worry less about being given less food than other people	Long time	85	85

Note: [a] *n* months to attain goal [b] Personal importance; [c] Desirability; Scales: 1–100

Appendix H

Study 3(b) Fast Forward Phase 1 Questionnaire Text

[Intro]

Thank you for signing up to take part in this study. Just to remind you, here is the overview of how to take part:

Complete this questionnaire. One credit granted.

Sign up for Fast Forward Part Two on the Royal Holloway Experiment Management System (EMS). You will be sent an invitation code so you can book a slot. This must take place between one and seven days after you complete this questionnaire.

Remaining credits granted

[Consent Form]

My name is Jess Darby. I am a PhD research student at Royal Holloway, University of London. I am carrying out a study on episodic future thinking supervised by Professor Andrew MacLeod. If you would like to discuss any aspect of the research, you can contact me by email at jess.darby.2009@live.rhul.ac.uk or Professor MacLeod at a.macleod@rhul.ac.uk. We very much appreciate your participation. We hope that this study will contribute to understanding of future thinking and wellbeing.

The first task in this study is to complete this questionnaire. This will take around 20-30 minutes and can be done by you online, in a quiet place, at a time to suit yourself. Next you will be asked to come to the Department for a further one-hour session in the next seven days. You will be asked questions about future events and given questionnaires to complete. In this study your data will be identified by a number so the information is completely confidential.

You do not have to take part in this study if you don't want to. If you decide to take part you may withdraw at any time without having to give a reason. Your decision whether or not to take part will not affect your education in any way.

By moving to the next page, you consent to participate in this experiment.

[Page 3]

We are interested in things that really matter to you and that you see yourself moving towards over the next year. We want you to write five of these down, in no particular order. They should not be major life events such as graduation or getting married. In this study, we are interested in knowing about things that you really hope to make happen in the next year or so, no matter how important or trivial these could sound to other people. These goals can relate to any area of your life, not just your education but your hobbies, your family, your health, your relationship or anything else.

Q1

Write about something that really matters to you that you see yourself moving towards over the next year.

Q2

What is the next step for you towards achieving this goal?

Q3

Please rate how important this is to you

This goal is important to me personally (1=not at all; 7=extremely)

Q4

Please rate how desirable this is to you

This goal is desirable to me personally (1=not at all; 7=extremely)

Q5

When do you foresee this goal being achieved? (Drag and drop a date into the box or enter your own estimate)

6 months 12 months 18 months other (state when)_____

[repeated for five goals

At the top of each page is the following reminder

Reminder

We are interested in things that:

- really matter to you and that you see yourself moving towards over the next year
- not major life events such as graduation or getting married
- things that you really hope to make happen in the next year
- can relate to any area of your life"

Q21 I want to go back to the task you did earlier where you thought about things that are goals for you. Lots of other people have done this same task This time, I want you to give me five goals that you think other people might have said, so it is not about you but is an exercise in imagining the sorts of things that other people might have said that they see as goals. You should not repeat things that you have said.

[participant gives five goals]

Q 22

Please rate each of these goals for how important they are to you (rather than to the other person you imagined when you thought of each goal.)

This goal is important to me personally (not the other person) (1, Not at all 7, Extremely)

Q23

Please rate each of these goals for how desirable it is to you (not the other person)

This goal is desirable to me personally (not the other person). (1=not at all; 7=extremely)

9. Here is the final question on other people's goals. Can you imagine when the other person might realistically achieve this goal? When do you foresee this goal being achieved?

[drag and drop a date into the box or enter your own estimate]

6 months 12 months 18 months other (state when)_____

[Intro text]

You will now be presented with a series of questions asking you to generate mental imagery. For each scenario, try to form a visual image and rate how vivid it is using the five-point scale below each question. Please note that there are no right or wrong answers to these questions and it is not necessarily desirable to experience imagery or, if you do, to have more vivid imagery.

10. **Conjure up an image of a friend or relative who you frequently see; how clearly can you see the contours of their face, head, shoulders and body?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

11 **Still imagining that friend or relative, how strongly can you see the characteristic poses of their head and body?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

12. **How well can you envision the way that friend or relative walks, the length of their step, for example?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

13. **Rate how vivid the colours of that person's clothes look in your mind?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

14. **Visualise a rising sun and look carefully at the details of that mental picture; how clearly do you see that sun rising above the horizon in a hazy sky?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

15. **Imagine the sky clearing and surrounding the sun with blueness, how vivid is that image?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

16. **Clouds appear in your sky and a lightning storm erupts - how well can you see it?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

17. **A rainbow appears in your sky, how clearly can you make it out?**

No image at all	
Vague and dim	
Moderately clear	
Reasonably clear	
As vivid as real life	

[Thank you!]
Thank you very much for taking part in this phase of the study. Your response is very important to us.

Please now visit the website [link] for the RHUL Psychology Department's Experiment Management System and sign up for "Fast Forward Two". Just to remind you that this second session lasts one hour and must take place between one and seven days from today.

If you have any questions, please feel free to email jess.darby.2009@live.rhul.ac.uk.

Appendix I

Table I: *S4 Variables By Category, With Questions From The PCQ*

Category	*Variable*	*Question text or content*
Autonoesis	*Pre-reliving*	While imagining the event, I feel as if I am really there (1 = not at all, 7 = totally)
	Mental time travel	While imagining the event, I have the impression of going into the future and finding myself at the time that the event would happen (1 = not at all, 7 = totally)
	Autonoetic	*M* of Autonoetic 1 & 2
Sensory	*Clarity*	My overall representation for this event is clear
	Location	My representation for the location where the event takes place is clear
	Spatial	The relative spatial arrangement of people and objects in my representation for the event is clear
	Visual	My representation for this event involves visual details
	Sounds	My representation for this event involves sounds
	Smells	My representation for this event involves smells
	Taste/touch	My representation for this event involves tastes and/or touch
	Overall Sensory	*M* of the seven phenomenological variables
Event Properties	*Event Novelty*	I have already experienced the same or similar event (1 = never, 7 = very often)
	Location Familiarity	The location of the event is familiar
	People/object Familiarity	The people and objects in my representation are familiar to me

Self Narrative	*Personal importance*	This event is personally important to me in terms of my goals and values (1 = not at all important, 7 = very important)
	Emo. valence	The emotions I have when I imagine the episode are 1=extremely negative; 7=extremely positive)
	Cued recall	When imagining the event, other specific past or future events came spontaneously to mind (1 = none, 7 = a lot)
	Life in General	When imagining the event, I thought about my life in general (1 = not at all, 7 = very much)
	Personal plausibility	This event could plausibly happen to me personally (1 = not at all, 7 = extremely)
Manipulation Checks	*Global plausibility*	This event could plausibly happen to anyone (1 = not at all plausible, 7 = extremely plausible)
	Previous Thoughts	I have thought about this event before (1 = never, 7 = very often)
	Difficulty	How difficult did you find the task? (1 = very easy; 7 = extremely difficult)
	Desirability	How desirable was this event? (1 = would not want to do it at all, 7 = highly desirable)
	Motivation	How motivated were you to perform well in this task? (1 = not at all; 7 = highly motivated)
	Belief	NEAR FUTURE EVENTS ONLY Right now, how likely is it that the imagined event will take place in the next two weeks? (1 = not at all likely; 7 = completely likely). DISTANT FUTURE EVENTS ONLY Right now, how likely is it that the imagined event will take place in the next 12-18 months? (1 = not at all likely; 7 = completely likely).
Simulation Properties	*Simulation Time*	Latencies to simulate each scenario, in seconds.
	Word Count	Number of words used to describe simulation, less fillers.
	Fillers	Number of fillers used in description of simulation

Appendix J

Study 3(b). Examples of transcripts

(Salient, close) Experimental cue. Go to a friend's house to watch a film.
OK, I'm going to my friend's room erm, to watch Elf the film because we celebrate Christmas way too early. Erm, even though we tell other people off for celebrating Christmas we think why not, so we think it's quite funny so it makes me quite happy and I think it's, so I start to laugh. Erm there's about five of us there, erm we're all squeezing in her single bed, which is really squashed up so it feels quite hot and quite stuffy but we don't really care because we're quite excited. Erm, then we try and get it up on her Apple computer, erm and it starts to play and it makes us really excited for Christmas. Erm, I can smell popcorn and they're all eating popcorn and sweets. Erm, yeah.

(Not salient, distant) Experimental cue: Changing the way I dress.
OK, I'm at home erm, in one of the spare rooms where we keep all the winter clothes and because it's just moving into winter now I have, er, opened the bed out and that's where I store my winter clothes in the erm summer months. So I'm putting my summer clothes away and taking my winter clothes out and looking at them and deciding which ones I want to wear this winter. Erm, I'm feeling a bit sad because I do prefer summer to winter, erm but I do quite like my winter clothes and so I'm finding all the fluffy ones and all the really warm ones and sorting them out into piles of which ones need washing. Erm my dad's on his computer in the same room so I can hear him tapping away at his keyboard and sighing because he can't work his computer. Erm, and, I'm asking my dad questions about if he thinks this is nice or not and he doesn't really know.

(Not salient, close) Experimental cue: Trying a new recipe.
I'm in my friend's kitchen in, on campus. Erm, I'm attempting to make a quiche erm, which I don't know why because I don't even really like quiche. But, I'm adding flour and eggs into a bowl. Erm my friend's sitting

at the table and rolling her eyes because I'm making quite a big mess. Er, but the flour feels quite soft and the egg feels sort of warm. Erm I'm attempting to follow a recipe book that's erm quite dirty but quite a big recipe book. Erm and it doesn't really smell of anything at the moment but I think that when I start to make the middle bit it probably would start to smell. Erm I'm mixed everything up together and it doesn't look very nice erm but I thought I'd just go with it anyway because I've made it now. Erm so I put it in the oven and I set the timer and it starts to cook.

(Salient, distant) Experimental cue: Improving at tennis.
Erm it's quite dark and cold and I am walking down to the tennis courts on the university campus. Erm it's the usual training time, so that's on a Thursday and erm I'm walking down with my friend erm we start to play tennis and we are having a really good time and we start to get to know the team more. Erm we get selected for matches which makes us really happy even though it is still really really cold out. Erm I am wearing quite a lot of layers but because we are running around a lot I can't really move in them very well erm but still it's quite funny and everyone is laughing. Erm we are having quite a high intensity session but it's still good fun, erm. And we are planning to play more matches for the university erm in.

Appendix K

Study 4. Examples of drawings from Aaronson (1966)

FIGURE 1. Standard scene painted under pre-series control condition.

FIGURE 2. Standard scene painted under *no past* condition.

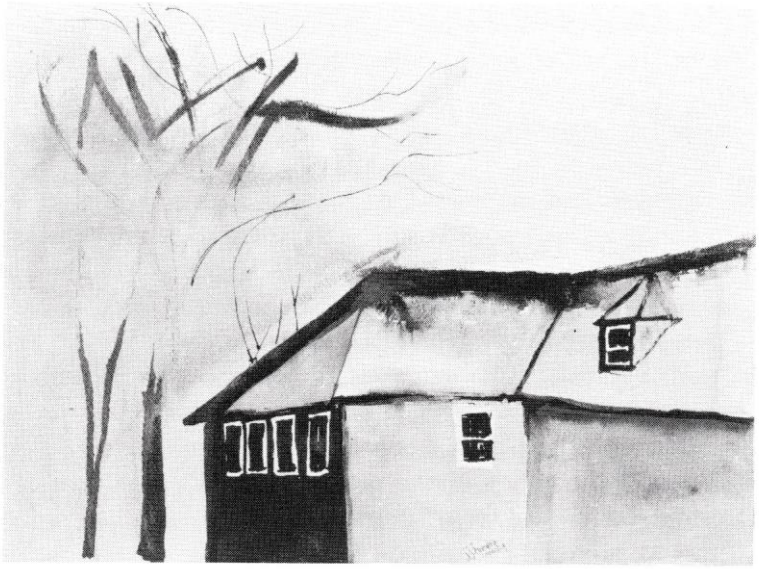


FIGURE 3. Standard scene painted under *no future* condition.

FIGURE 6. Standard scene painted under *expanded present* condition.

Appendix L

Table L.1: *Study 4(a) Phase 1 Ratings by Global Score Descending Order*

		Rating				
Event	***n***	***Plausible***	***Frequent***	***Image***	***Global***	□
Stay in with a friend, partner or family member and share pizza and a movie	31	5.81	4.68	6	5.5	0.76
Go on a shopping trip to buy a specific item (e.g. clothes, shoes, equipment)	33	5.64	4.79	5.76	5.4	0.88
Meet up with a friend for coffee/ hot chocolate	32	5.19	4.09	5.44	4.91	0.89
Friend's house to watch a film	33	5.3	3.85	5.33	4.83	0.81
Go to the cinema	33	4.94	3.39	5.27	4.53	0.78
Go out for a meal	33	4.79	3.45	5.3	4.51	0.74
Do some voluntary work (e.g. work experience, giving up time without being paid)	32	4.53	3.34	4.97	4.28	0.87
Attend a party or some sort of celebration	29	4.79	3.31	4.52	4.21	0.85
Make a new recipe that you have never cooked before	32	4.28	3.38	4.78	4.15	0.91
Attend a routine medical or dental appointment	31	4.26	3.06	4.42	3.91	0.79
Attend a progress meeting at work/school/College	29	4.31	2.48	4.83	3.87	0.65
Work out in a gym or at a fitness class *	31	4.1	3.23	4.03	3.79	0.87
Invite someone round and cook dinner for them	31	3.45	2.45	4.03	3.31	0.81
Go to a club night or event	32	2.97	2.09	3.53	2.86	0.84

Note * 31 nominations for other types of fitness were made in Phase 2. Thus this item was reworded to *Do some fitness or exercise* and used as a cue in Study 4(b)

Table L.2: *Study 4(a) Frequency & Specificity of Events in Phase 2*

N = 136	**High Frequency and /or Low Specificity***		**Low Frequency and /or High Specificity****		**Suitable if re-worded**
Theme (n)	Study & Practice (53)	Home & Leisure (23)	Creative (17)	Specific (12)	Fitness (49)
Sub themes (*n*)	Studying (31)	Socialising with friends or partner (9)	Art and craft (7)	Work (4)	Rugby, Swimming Dance, Gym, Running (6)
	Music practice (12)	Family time (8)	Drama (3)	Driving lesson, football match, Long-term thinking, Maintain motorcycle, Night club, Police cadets, Smoke weed, Wine bar	Walking (5)
	Tutor (10)	Social media & gaming (5)	Making music (5)		Football (4)
		Domestic chores	Creative writing, Debating		Badminton, Basketball, Circuits, Exercise, Fencing, Netball, Skating, Tennis, Trampolining, Yoga

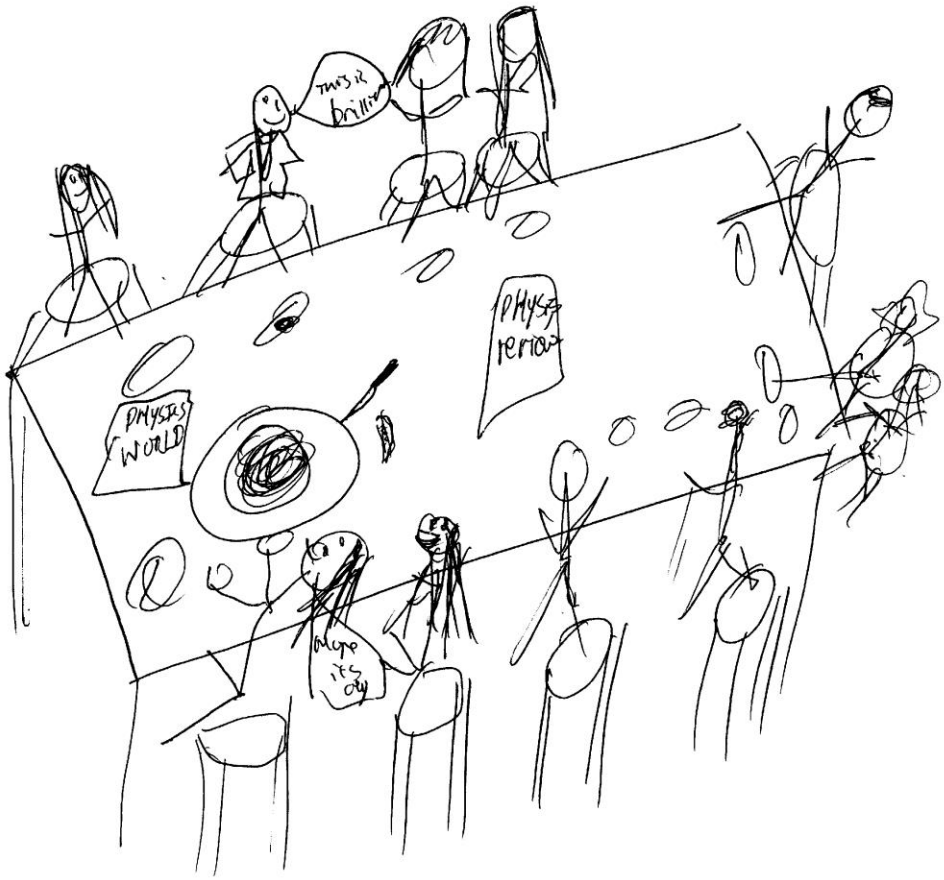
Note * *Potentially so frequently experienced they would not be suitable for the not-salient conditions* **Potentially highly salient to some but not all participants*

Appendix M

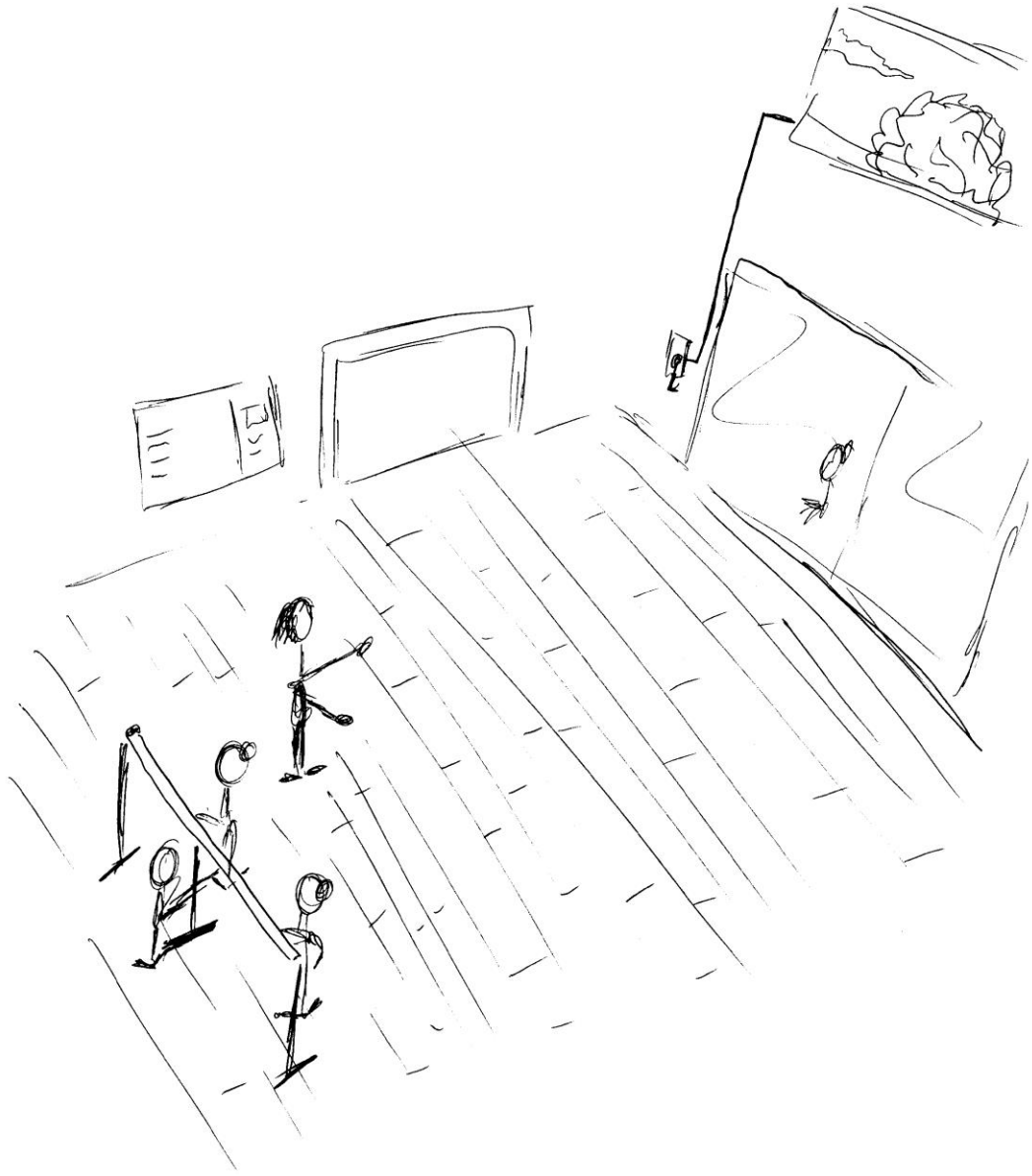
Study 4(b). Drawings with bystanders

1. True Past

2. Imagined Past



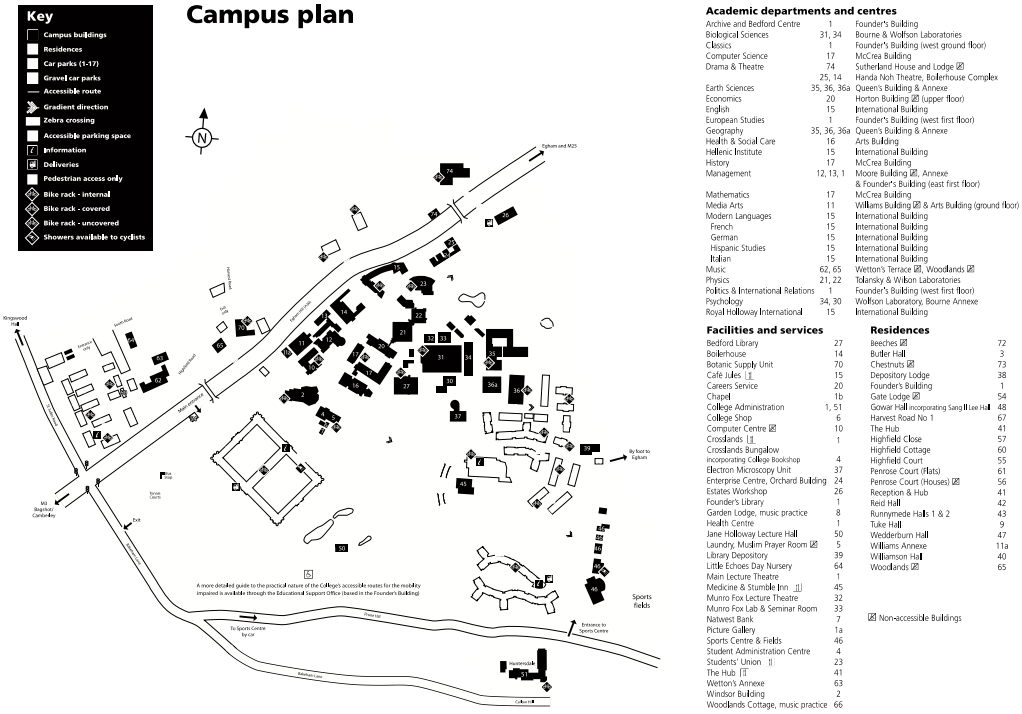
3. True Future

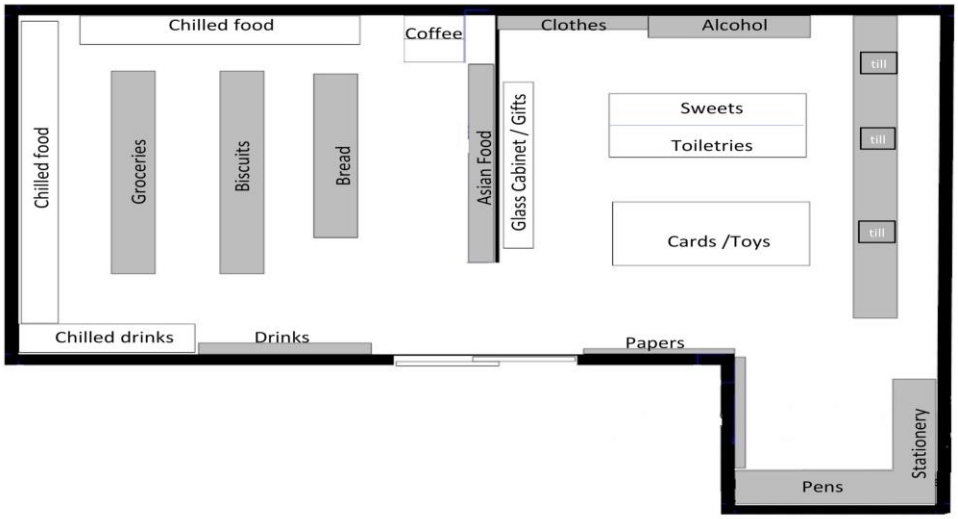


4. Imagined Future

Appendix N

Study 5 (a, b). Map of College and Internal Layout of College Shop



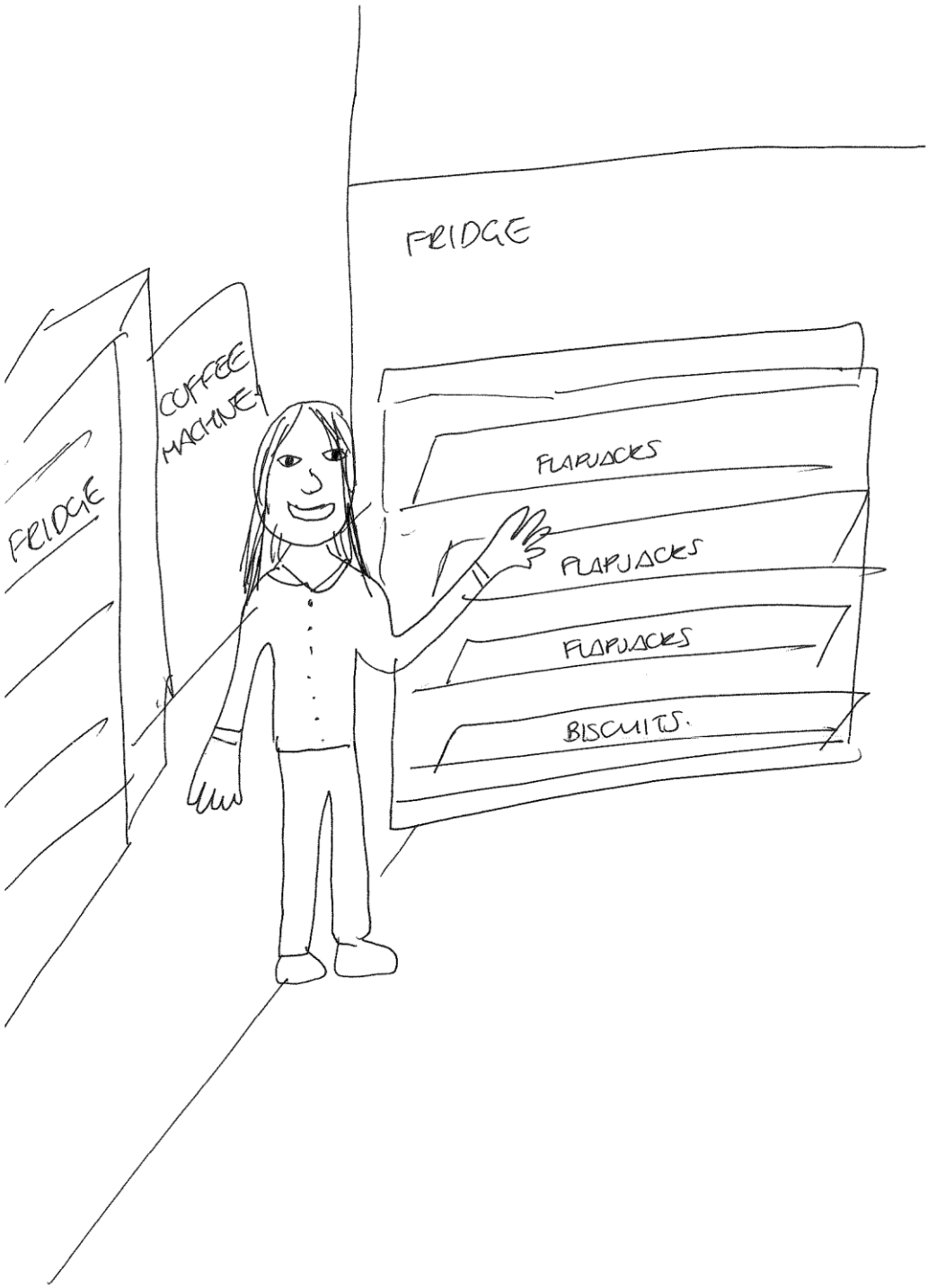


Appendix O

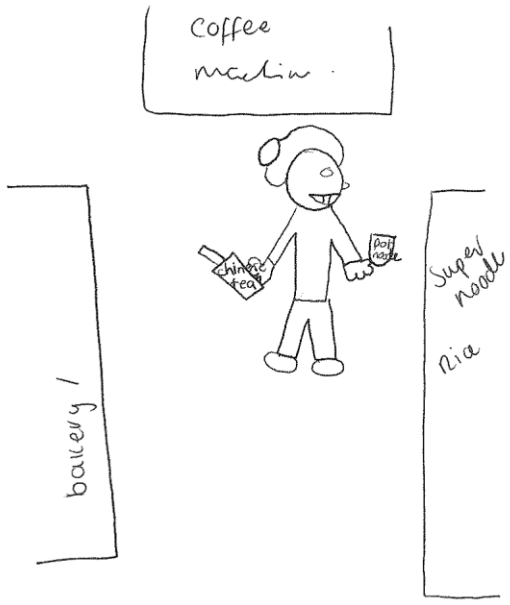
Examples of drawings made in Study 5

1.

2.


FRIDGE
COFFEE MACHINE
FRIDGE
FLAPJACKS
FLAPJACKS
FLAPJACKS
BISCUITS

3.



4.

Key (Study 5 drawings)

1 = Truth teller

2 = Liar

3 = Liar

4 = Liar