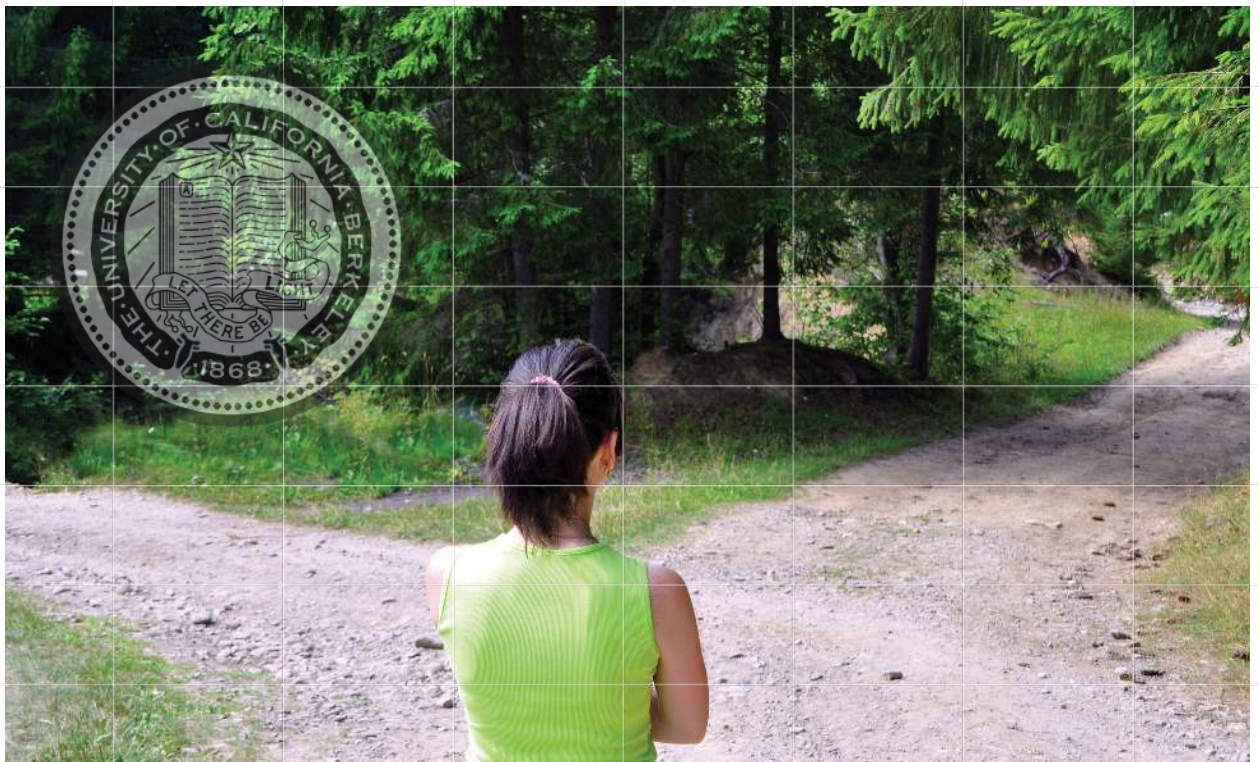


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Future-Mindedness



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Future-Mindedness

EXECUTIVE SUMMARY

Considering the best route home, deciding whether to take the stairs or the elevator, fantasizing about what you will do when you retire. What do they have in common? They all involve thinking about your possible future. What will happen if you go there or do that—and what will it mean for future you?

This remarkable ability to consider our future—indeed, our many possible futures—is called “prospection” or “future-mindedness.” It’s a special skill that humans have developed to a unique extent; some even argue that it provides a framework for understanding topics ranging from perception, cognition, and memory to consciousness and free will.

But how does prospection work? When do we develop this ability? What is it good for? What happens when it goes awry? And can it be improved?

In recent years, there has been a growing interest in studying various facets of prospection, and several fascinating discoveries have shed light on the subject while also opening up exciting future avenues for research.

What is prospection?

What, exactly, is prospection? Psychologists offer various definitions, ranging from “our ability to ‘pre-experience’ the future by simulating it in

our minds” to the “unrivaled human ability to be guided by imagining alternatives stretching into the future” to simply “the act of thinking about the future.” Even related terms such as “foresight,” “imagination,” and “mental time travel,” can fit under the umbrella of prospection. This paper, which is framed around research funded by the John Templeton Foundation’s Science of Prospection awards, will use an expansive definition of prospection—essentially, “Thinking about the future.”

In a 2013 paper, psychologist Martin E. P. Seligman, philosopher Peter Railton, psychologist Roy F. Baumeister, and philosopher/psychiatrist Chandra Sripada named prospection “a core organizing principle of animal and human behavior” that provides a new framework for understanding psychology. While others have debated whether this framework is indeed a new way of viewing psychology, research suggests that elucidating how people think about the future has important ramifications for understanding human behavior.

How does prospection work?

When people think about the future, they tend to think both about what the future might be like (I bet there will be cake at this party) and how they might feel about it (I'll be so happy if there is cake). Additionally, people can think about possible future events in at least two modes of thought: inner speech and mental images. Research suggests that people tend to use more abstract thought, such as relying more on inner speech, when considering events that are further in the future.

How often do people think about the future?

A study of social media posts found about 15 percent of messages mentioned the future, while a different study that asked people to write about what they were thinking about the last time their mind had wandered found about 43 percent of the sentences were about the future.

Research suggests that thinking about the future is intimately tied to memory. For example, one study found that people asked to envision specific future events occurring in a familiar setting (e.g., their home) provided more sensorial detail (visual details, sounds, smell/taste) than those asked to describe the same event occurring in an unfamiliar setting (e.g., the North Pole). This may help explain why near-future imaginings are often more vivid than more distant future-thought. Imagining a distant future is more likely to involve a more dramatically different context—a different job, house, or partner, for example—than imagining our lives next week.

Prospection and the brain

Studies of people with brain damage and neuroimaging studies of healthy participants suggest that both the medial temporal lobe and the

frontal lobe are brain regions involved in thinking about the future. Both of these structures are part of the brain's "default mode network" (DMN), a large-scale system of brain regions that are active when people are not explicitly engaged in a particular task, raising the intriguing possibility that minds at rest spontaneously engage in mental time travel, including simulating possible futures.

Several studies have explored the relationship between the DMN and prospection. For example, one neuroimaging study found a common pattern of neural activity within the DMN when participants engaged in remembering their past, imagining their future, or trying to take on the perspective of another person.

Prospection and development

Children begin to develop episodic prospection in their preschool years, and this skill continues to develop through middle childhood, adolescence, and young adulthood. In particular, the time period between ages three and five seems especially critical for the development of prospection. For example, one study found that four and five year olds chose to bring puzzle pieces to a second room that they knew contained a puzzle board but not to a room that did not contain the board, suggesting that they were able to think ahead (three year olds' selections appeared to be more random).

There have been fewer studies examining prospection in middle childhood. But some research suggests that children increase the number of specific details that they include in their descriptions of future events as they get older.

There is some evidence to suggest that prospection ability isn't static in adulthood, either. One study found that the ability to create

detailed descriptions of past and future episodes increased during development, peaking in young adults (around age 21)—and then declined again with age.

Functions of propection

Being able to imagine our future is such an important part of human life that it's difficult to imagine how we would function without it. For instance, research suggests that propection plays a vital role in navigation, both for humans and for other animals such as rats; evidence even suggests there may be a neuroscientific basis for why some people are better navigators than others.

Indeed, studies indicate that propection may be vital to several key domains of life:

Propection helps us make decisions

Perhaps one of the most fundamental and important functions of propection is that it informs how we decide which actions to take (or avoid). Several studies have shown that how we think about the future (and our future selves) can influence whether we choose a smaller reward now or a larger reward in the future. Other studies have found that thinking about the future from a more distanced perspective can help us consider complicated issues more wisely. And a different set of studies suggests that people who tend to think further into the future make more future-oriented—and less risky—decisions.

Propection motivates us to achieve our goals

Propection has another important application: It motivates us to achieve our goals. Interestingly, and perhaps counterintuitively, research

has found that the more people positively fantasize (think and picture a desired future) about successfully reaching their goals, the less effort they actually put into realizing them. However, we can turn these fantasies into goal-directed behavior by contrasting them with our current reality, allowing us to see elements of our current situation as barriers that can be overcome. Multiple studies have found that this type of mental contrasting—particularly when combined with plans for dealing with predicted obstacles—can help people achieve their goals, whether that means losing weight, developing better exercise habits, or getting better grades.

Social benefits of propection

The benefits of propection do not seem to be limited to achieving one's personal goals; there may be social benefits as well.

For example, one study found that adopting a more future-oriented view about a relationship conflict led participants to express more “adaptive reasoning” about the conflict: They blamed their partner less, showed greater insight about how the conflict impacted their relationship in a constructive and positive way, and demonstrated greater forgiveness.

Other studies suggest that how we think about the future can influence our prosociality—the extent to which we are cooperative, kind, and generous to others. For instance, one set of experiments found that participants who were asked to imagine helping someone were more willing to actually help the person in a later survey—and this effect was even stronger when people were asked to imagine the helping scenario more vividly.

Prospectio a d the pursuit of happi ess

Research also shows how prospection helps us pursue happiness (albeit imperfectly). In particular, a body of work suggests that human behavior is often guided by how we think we will feel in the future. People undertake actions now that they believe will increase their future happiness.

However, research also suggests that when people think about how they are likely to feel in the future, they don't always make correct (or even reasonable) predictions. In particular, their simulations of the future are often unrepresentative, essentialized, abbreviated, or decontextualized. Incorrect predictions aren't always a bad thing, though. For example, one study found that professors overestimated how upset they would feel when denied tenure. This overestimation of future grief—while inaccurate—likely led them to work harder and improved their odds of achieving tenure.

When prospection goes awry

Sometimes prospection goes awry: People don't always think about the future in ways that are good for their mental health. A growing body of work suggests that deficits in prospection can contribute to—and sometimes be the source of—symptoms for a whole host of conditions, including depression, anxiety, ADHD, and addiction. Research suggests that depression, in particular, can be worsened (and maybe even caused by) dysfunctional prospection.

Improving prospection

Fortunately, a growing body of studies suggests that particular techniques can be used to target prospection in order to improve the symptoms of disorders, such as depression, as well as to encourage overall psychological growth. For example, some techniques used in cognitive behavioral therapy (CBT) involve correcting how people think about the future, and some studies have shown that CBT can improve prospection. In addition, psychologists have developed various treatment packages that are explicitly future-oriented, including future-directed therapy, hope therapy, and solution-focused therapy. A recent study suggests that prospective writing—writing about new opportunities or new doors that may open in the future—might encourage post-traumatic growth.

Future directions

The science of prospection is increasingly an interdisciplinary area of interest with many questions left to be explored. These include answering remaining basic questions about the nature of prospection, such as how different forms of thinking about the future relate to each other and whether they share similar mechanisms, how thinking about the future changes across development and throughout the lifespan, and what the potential downsides of prospection are—missing out on savoring the here and now, for example. Additionally, many open questions remain as to the connection between prospection and depression, including whether future-focused therapies are more effective than present-focused interventions. Finally, how best to improve people's prospection abilities is an important area for future research.



Table of Contents

Introduction	Page 7
What is Propection?	Page 9
How Does Propection Work?	Page 11
Propection cross the Lifespan	Page 16
Functions of Propection	Page 19
Dysfunctional Propection	Page 31
Improving Propection	Page 36
Limitations and Future Directions	Page 38
References	Page 40
cknowledgements	Page 48



Introduction

anticipating which way to turn when you're driving, fantasizing about your next vacation, deciding to contribute to a retirement account, wondering what your child will be like someday. What do all of these things have in common? They all involve, at some level, thinking about our possible futures.

And according to psychologist Martin E. P. Seligman, philosopher Peter Railton, psychologist Roy F. Baumeister, and philosopher/psychiatrist Chandra Sripada, this ability to think about the future—what they call “prospection” or “future-mindedness”—is “a core organizing principle of animal and human behavior” that provides a new framework for understanding psychology. In a 2013 paper, they argue that prospection casts “new light” not only on “perception, cognition, affect, memory, motivation, and action” but also on subjects as wide-reaching and monumental as free will, subjectivity, and consciousness. (Seligman, Railton, Baumeister, & Sripada, 2013)[383]. (They later expanded upon this vision in a 2016 book, *Homo Prospectus* (Seligman, Railton, Baumeister, & Sripada, 2016)[87].)

In 2014, with hopes of expanding the “scientific understanding of the mental representation and utilization of possible futures,” and with financial support from the John Templeton Foundation, the researchers awarded \$2.3 million across 18 projects designed to explore different angles of the science of prospection. These projects ranged from examining the psychological mechanisms that enable us to think about the future to exploring the applications of thinking about possible futures and uncovering ways that people's abilities

of prospection can be improved.

These projects produced a wide range of insights into the nature of prospection (or “future-mindedness”) that will form the backbone of this paper. That said, this paper will also cover research performed before Seligman and colleagues announced their initiative and will attempt to place their work in the context of a larger body of research. Because the Science of Prospection awards were predominantly focused on the psychology of human prospection—exploring how people think about the future and how this impacts their behavior—this subject is also the predominant focus of this paper, although it also includes some discussion of research from other disciplines, including economics, philosophy, and neuroscience. Similarly, while the paper touches on psychological concepts that can involve thinking about the future—such as imagination, fantasy, strategic foresight, and self-control—it is principally focused on describing what is known about the basic science of prospection, mirroring the focus of the JTF-funded research.

Besides this introduction, the paper is broken into seven chapters. The next chapter (Chapter 2) discusses possible definitions for prospection and considers whether prospection does in fact

provide a new framework for thinking about psychology, as Seligman and his colleagues claim. The third chapter gets into how prospection actually works, discussing how we think about the future and the cognitive and biological mechanisms that underlie this thinking. The fourth chapter explores what is known about the development of prospection in individuals and how it changes across a person's lifespan. The fifth chapter delves into various functions and applications of prospection. The sixth chapter explores how prospection can go awry and teases out the

relationships between dysfunctional prospection and various psychological disorders. The seventh chapter considers possible ways that people can improve their skills of prospection. And the final chapter discusses limitations and possible future directions for this research.

In this white paper, the number of citations (as of December 2018) for a particular study or review paper is indicated in brackets [] next to that citation; highly cited studies (>50 citations) are indicated in **bold**.



What is Propection?

Humans aren't the only animal species that can make predictions about the future. For example, a cat may come running to the kitchen when they hear a can opener because they predict that cat food awaits them. Or a dog may get excited when they see their owner holding a leash, anticipating a walk in their near future. There's even evidence that some apes and certain species of birds, such as ravens, can select and save tools that they plan to use in the future (Mulcahy & Call, 2006) [503] (Kabadayi & Osvath, 2017)[34] (although interpretations of this research are under debate (Suddendorf & Corballis, 2010) [113] (Redshaw, Taylor, & Suddendorf, 2017)[7])).

But our ability to think about the future extends beyond that of other animals. For example, we can think about (and plan for) the distant future—such as by saving for retirement—and we can make predictions about our own future based on what we've learned about other people's experiences. This is a remarkable feat—a superpower, really, that distinguishes humans' capacity for propection from that of other species. The name of this superpower? Propection.

But what, exactly, is propection? Like other emerging concepts in psychology, it depends on whom you ask. Propection “refers to our ability to ‘pre-experience’ the future by simulating it in our minds,” according to psychologists Daniel Gilbert and Timothy Wilson (Gilbert & Wilson, 2007) [950]. Randy Buckner and Daniel Carroll, also psychologists, conceive of propection as simply “the act of thinking about the future”(Buckner & Carroll, 2007)[2222]. In their book, *Homo Propectus*, Martin E. P. Seligman, Peter Railton, Roy F. Baumeister, and Chandra Sripada define propection as the “unrivaled human ability to

be guided by imagining alternatives stretching into the future” (Seligman et al., 2016)[87].

In fact, questions about the future are so ubiquitous in different fields and subfields that there are many related terms used to describe thinking about the future. These include ‘future-mindedness,’ ‘episodic future thinking,’ ‘pre-experiencing,’ ‘mental time travel,’ ‘foresight,’ ‘prospective memory,’ and ‘imagination,’ among others. While these terms have different connotations in their respective fields, they all can or do involve thinking about the future—and thus fit under a broad categorization of propection, so will be included in this paper where appropriate. For the purposes of this paper, we will use an expansive definition of propection, considering it to include any version of thinking about the future.

Is Propection a New Framework for Viewing Psychology?

In a 2013 paper, Seligman and colleagues note that the idea that propection is important “is not remotely a novel idea”(Seligman et al., 2013)[383].

Yet they argue both in this paper and in *Homo Prospectus* that the subject has been overlooked by the field of psychology, which has had a “120-year obsession with memory (the past) and perception (the present)” and an “absence of serious work on such constructs as expectation, anticipation, and will” (Seligman et al., 2016)[87] (p. xi).

But there has been some pushback against the idea that prospection has been mostly ignored in psychology. “We agree with the authors that prospection is an important process; however, we disagree that it has been neglected within the psychological literature,” write psychologists Jun Fukukura, Erik Helzer, and Melissa Ferguson in a response to Seligman and colleagues’ 2013 paper. “Although few psychologists use the term prospection, it is evident that researchers in fields as diverse as self-regulation, judgment and decision making, learning, memory, automaticity, and computational neuroscience (to name a few) are deeply interested in how representations of the future affect current behavior.” (Fukukura, Helzer, & Ferguson, 2013)[14]. “Since at least the 1960s and the blossoming of modern self-regulation research, psychology has embraced the notion that an organism’s desired states of the world influence its behavior right now.”

In a review of *Homo Prospectus*, psychologist Dam Bulley also highlights how thinking about prospection isn’t that new a concept (Bulley, 2018)[1], mentioning that prospection was seriously discussed by many scholars throughout history, including ancient Roman philosopher Seneca the Younger (65 CE), seventeenth-century political philosopher Thomas Hobbes (who wrote, “the opinions men have of the rewards and punishments which are to follow

their actions are the causes that make and govern the will to those actions”), among many others.

Bulley also points out how the subject of prospection has been taken up by the field of psychology specifically, noting that William James discussed the concepts of deliberation, anticipation, and voluntary action in *Principles of Psychology II* in 1890. “James pre-empted or founded much of our current discussion, and it would be difficult to identify any significant hiatus in the interim,” writes Bulley. “The significance of prospection has long been recognized.” While Bulley cautions that “claims that the current surge of research amounts to a radical paradigm shift in psychology need to be taken with a grain of salt,” he also acknowledges “a rapid growth in cross-disciplinary work” on scientific questions related to prospection.

In fact, it could be that the term “prospection” is the most controversial part of Seligman and colleagues’ proposal. While they see it as presenting a unified framework for understanding multiple facets of psychology, others see it as being at risk of “becoming a buzz-word” (Bulley, 2018) [1] or a sign of a “creeping McDonaldization of psychology” (Krueger & Mairunteregger, 2017)[0].

However, beyond that point of contention, there appears to be agreement across the field that: 1) elucidating how people think about the future is important for understanding various psychological topics; 2) there has been either continued or growing interest in the topic (although not often under the name “prospection”); and 3) prospection is a subject that merits further attention and exploration.



How Does Propection Work?

So propection is important. But what do we actually know about how it works, including the brain mechanisms involved in this ability? This section will provide a brief overview of the cognitive and neuroscientific mechanisms that underlie our capacity to imagine what our life might be like this afternoon, tomorrow, or three decades from now.

How Do People Think about the Future?

According to Gilbert and Wilson, in addition to the abstract concept of “propection,” there is also a more discrete phenomenon called “a propection,” which is a type of “mental representation” or internal model of the external world, similar to a memory (a mental representation of a past event) or a perception (a mental representation of a present event) (Gilbert & Wilson, 2007)[950]. Propection can involve both “conceptual content and affective states” according to Buckner and Carroll (Buckner & Carroll, 2007)[2222]. In other words, when thinking about what future experiences might be like, we often think about how things might be (the shop may be out of donuts) and how we might feel (I’ll feel grumpy if they’re sold out). Importantly, as this paper will cover later, our predictions—especially about our feelings—are often wrong.

Additionally, people can think about possible futures in at least two modes of thought: verbal (inner speech) and visual (mental images). Some research suggests that when people think further into the future, they are more likely to use more abstract thought, such as verbal thoughts, because it is more difficult to visualize a distant future when we might then be living in a different place,

doing different things, and interacting with different people (Smith, Iyengar, & Trope, 2009) [157]. Other research, however, suggests that it may be impossible for people to engage in verbal thought without invoking some kind of visual imagery (Smith, Hoeflin, Hamzah, & Fedorenko, 2017)[10]. Regardless of which mode of thought we use, evidence suggests that we do conceptualize the distant future as being more abstract. For example, one study found that people provided more sensory detail when asked to think about events that may happen in the next year than they did for events that may happen in five to 10 years (D’Armentano & Van der Linden, 2004)[598].

Given that we think about the distant future more abstractly, one might think that we would feel more confident in making predictions about the near future than the distant future. However, one study found that while people used relatively abstract information to make predictions about the distant future, they were equally if not more confident about their distant future predictions (Nussbaum, Liberman, & Trope, 2006)[155]. This corresponds to other studies that have found that people tend both to be more confident about their predictions and to think more optimistically about the distant future than the closer future

(Gilovich, Kerr, & Medvec, 1993)[330](Savitsky, Medvec, Charlton, & Gilovich, 1998)[93].

But there may be a caveat to this finding. A recent review posits that “pragmatic prospection”—thinking about the future in order to “guide actions toward desirable outcomes”—is actually a two-step process (Baumeister, Vohs, & Oettingen, 2016)[44]. The first stage of planning is idealistic and optimistic. But that stage is followed by a second stage that involves thinking about how we actually get to that outcome. The second, more planning-oriented stage requires us to anticipate possible outcomes and problems that we may encounter along the way. “The second stage is therefore cautious and even pessimistic,” write the authors.

How Often Do People Think about the Future and What Do They Think about?

Other studies have examined how often people tend to think about the future in real life and what they tend to think about. Using an automated computer classification tool, researchers examined people’s “temporal orientation”—their tendency to think about the past, present, or future—from their social media posts (Nie, Shepard, Choi, Copley, & Wolff, 2015)[1]. They found that people mentioned the future in about 15 percent of the messages.

Of course, that study looked at messages that people chose to post online. What about when people are free to daydream—how often do they think about the future then? In one study, online participants were asked to share what they were thinking about the last time their mind had wandered (Schwartz et al., 2015)[20]. Around 43 percent of the sentences were about the future.

An automated classification program discovered that people’s future-oriented mind wandering could be classified into two parent categories:

sentiments about a fixed future—normally deciding between two choices (e.g., I was thinking that I should do my homework tonight)—and sentiments about an open future with more open-ended musing (e.g., I was thinking about what to make for dinner tonight). Each of these two categories could be further broken down into “constrained” thoughts that conveyed more certainty (e.g., I am getting married in April, and there is a bunch of stuff left to be done) and “unconstrained” thoughts conveying less certainty (e.g., I was thinking about a trip that I may take at the end of the summer). Thus, future-oriented mind wanderings can be fixed and constrained, fixed and unconstrained, open and constrained, or open and unconstrained.

The Relationship Between Memory and Prospection

A robust set of studies suggests that how we think about the future is intimately tied to memory. For example, one study found that people asked to envision specific future events occurring in a familiar setting (e.g., their home) provided more sensorial detail (visual details, sounds, smell/taste) than those asked to describe the same event occurring in an unfamiliar setting (e.g., the North Pole) (Szpunar & McDermott, 2008) [254]. A similar result was found when participants were asked to envision a future event occurring in a recent setting (e.g., their house) or a familiar but more temporally remote setting (e.g., their high school). People also reported a stronger subjective experience—it felt more real—when projecting a possible future event in a more familiar location.

These findings help explain why near-future imaginings are often more vivid than more distant future-thought. Imagining a distant future

is more likely to involve a more dramatically different context (different job, house, or partner, for example) than imagining our lives next week. These findings also add evidence in support of what is known as “constructive episodic simulation,” the idea that people canvas elements from memory to populate their prospections (Schacter & Addis, 2007)[1118].

In other words, “[m]emories are the building blocks of simulations” (Gilbert & Wilson, 2007) [950], an idea that was itself prospected in the 1980s by psychologist Endel Tulving—who argued that episodic memories allowed for mental time travel (Tulving, 1985)[4350]—and neuroscientist David Ingvar, who published a paper with the title “Memory for the future” (Ingvar, 1985)[693].

What Parts of the Brain are Involved in Prospecion?

Studies of patients with brain damage provide additional evidence that remembering and prospecting may involve similar and overlapping mechanisms. For example, there are multiple reports of patients with damage to their medial temporal lobe—a brain region involved in episodic memory (the memory used to encode autobiographical memories of experiences and events)—who exhibited both amnesia and impairments in envisioning their own personal futures (Klein, Loftus, & Kihlstrom, 2002)[555](Hassabis, Kumaran, Vann, & Maguire, 2007)[1070].

Still further evidence comes from the famous, albeit tragic, case of H.M., from whom surgeons removed both medial temporal lobes to treat intractable epilepsy. H.M. lost both the ability to encode new episodic memories and the ability to make predictions about his future (Buckner & Carroll, 2007)[2222].

Studies of patients with brain damage also point to another brain region, besides the medial temporal lobe, that plays an important role in prospecting: the frontal lobe. Patients with damage to their frontal lobes can have deficits in making plans and in structuring multiple events into an appropriate sequence, such as is often necessary to make progress toward a long-term goal (Shallice, 1982)[4200](Milner, Petrides, & Smith, 1985)[574].

The involvement of both the medial temporal and frontal lobes in prospecting has also been shown in neuroimaging studies of healthy people. For example, a study that used positron emission tomography (PET) measured blood flow in the brains of healthy participants as they talked about past experiences, discussed future prospects, or—the control task—explained the meaning of various nouns. The results found more activity in several areas of the medial temporal and frontal lobes when people talked about the future and the past than during the control task, and there were specific areas within both of these lobes that activated more when people talked about their prospective experiences than their past experiences (Okuda et al., 2003)[609].

Another study that used functional magnetic resonance imaging (fMRI) to examine the brain areas involved in constructing and elaborating on past and future events found that there was a great deal of overlap between the areas activated by thinking of the past and those activated by thinking of the future (including the left hippocampus and left temporal pole), particularly during the elaboration phase of the task, although there were some areas that were preferentially activated by thinking about future events (including the right frontal pole and hippocampus) (Schacter & Addis, 2007)[1118]. “This striking overlap suggests that

episodic future thinking is indeed an important, if not the primary, function of the episodic system,” write the researchers.

Similar results were found in another fMRI study, further supporting the suggestion that our brains survey details from our memories to imagine and visualize what we think our futures might be like (Szpunar, Watson, & McDermott, 2007)[777]. Interestingly, this study found that there was similar activity in brain regions involved in visual-spatial processing when people thought about the future and the past, but brain regions involved in simulating bodily movements were more active when people thought about the future. The researchers suggest that they may have found this discrepancy because, when thinking about the future, “one must anticipate a series of actions that has not occurred before.”

Importantly, both the prefrontal cortex and the medial temporal lobes were found to be part of the brain’s “default mode network” (DMN), a large-scale system of brain regions that are active when people are not explicitly engaged in a particular task (Raichle et al., 2001)[9437], which raises the intriguing possibility that minds at rest spontaneously engage in mental time travel, including simulating possible futures (Buckner & Carroll, 2007)[2222].

Many studies have explored the basic structure and function of the DMN (for example: (Margulies et al., 2016)[131]). In particular, a growing number of studies have investigated the role of the DMN in spontaneous thoughts such as the types of thoughts we have when we let our minds wander (for meta-analysis see: (Fox, Spreng, Ellamil, Andrews-Hanna, & Christoff, 2015)[253]; reviews: (Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016)[219] (Fox, Andrews-Hanna, & Christoff,

2016)[14] (Zabelina & Andrews-Hanna, 2016)[45] (Andrews-Hanna, Irving, Fox, Spreng, & Christoff, 2018)[8]).

Other studies have more explicitly explored the relationship between the DMN and prospection (Gerlach, Spreng, Madore, & Schacter, 2013)[92]. For example, one fMRI study found a common pattern of neural activity within the DMN when participants engaged in remembering their past, imagining their future, or trying to take on the perspective of another person (theory of mind) (Spreng & Grady, 2010)[657].

And another fMRI study that asked participants to simulate solving a problem in order to achieve a particular (future-oriented) goal found that this simulation activated core regions of the DMN as well as the dorsolateral prefrontal cortex, an area involved in executive functions such as planning (Gerlach, Spreng, Gilmore, & Schacter, 2011)[166].

Neuroimaging studies have also explored how individual differences in mind wandering relate to brain differences. One fMRI study found that people who had more functional connectivity within a part of their DMN when resting also reported more of a tendency to mind-wander and to think about the future during periods of rest (Andrews-Hanna, Reidler, Huang, & Buckner, 2010)[456]. However, another study with different methodology found a negative correlation between daydream frequency and DMN functional connectivity (Kucyi & Davis, 2014)[152]. Other fMRI studies have found that people vary in their tendencies to experience different types of spontaneous thoughts (such as whether they tend to think more about the future or the past) and these varying tendencies can be mapped onto the activity of different parts of the DMN when people are at rest (Smallwood et al.,

2016)[56] (Poerio et al., 2017) [21] (Golchert et al., 2017) [41](Karapanagiotidis, Bernhardt, Jefferies, & Smallwood, 2017) [26](H. T. Wang, Bzdok, et al., 2018)[11] (Villena-Gonzalez et al., 2018) [4](H. T. Wang, Poerio, et al., 2018)[11].

One recent fMRI study that asked participants to write about three personal goals, engage in a period of mind wandering, and then write more about their goals found that participants who had the most future-related thoughts during

the mind-wandering task also developed the most concrete goals during the second writing task (Medea et al., 2018)[37]. These participants also showed a stronger coupling in activity between the hippocampus and the ventromedial prefrontal cortex (including a region involved in processing movement)—suggesting that communication between these brain areas may be involved in the mental simulation that people do when thinking about how best to achieve their goals.

Prospection cross the Lifespan

The last chapter explored some of the mechanisms that underlie our ability to consider possible futures. But when and how we do develop this ability? and how does it change throughout our lives?

When Do Children Learn to Consider Possible Personal Futures?

Research suggests that children begin to develop episodic prospection in their preschool years, and this skill continues to develop through middle childhood, adolescence, and young adulthood (Farr & O'Neill, 2005)[284] (Prabhakar, Coughlin, & Ghetti, 2016)[7].

In particular, the ability to engage in “episodic foresight” (when imagining the future influences one’s current choices), along with other elements of prospection such as delaying gratification and planning for the future, appears to increase significantly between the ages of three and five (Farr & Jackson, 2009)[162] (Quon & Farr, 2010)[41]. For example, one study found that while the majority of four- and five-year-old children could correctly respond to open-ended questions that required them to report about events that did or did not occur the previous day, and could accurately predict events that were or were not likely to happen the following day, only a minority of three year olds were able to do so (Busby & Suddendorf, 2005) [291].

Another study found that four and five year olds chose to bring puzzle pieces to a second room that they knew contained a puzzle board but not to a room that did not contain the board, suggesting that they were able to think ahead (three year

olds’ selections appeared to be more random) (Suddendorf & Busby, 2005)[323]. A similar study found that when asked to select objects that they would need in order to play a game in the future, three year olds generally performed poorly while five year olds generally did well (Russell, Alexis, & Clayton, 2010)[121]. Intriguingly, four year olds were better at answering questions about what a peer would need to play the game than what they themselves would need.

Other studies have examined whether four year olds can use their memory to solve a problem in a more distant future. For example, one study found that four and five year olds, but not three year olds, placed a toy in a room that didn’t contain toys so that they could play with it during a visit either in the immediate or more remote future (after their next birthday) (Farr, Louw, & Clayton, 2015)[36].

These studies suggest that children—and likely people in general—may use some of the same cognitive mechanisms to prepare for events that are occurring immediately, in the next few minutes, or months later. Interestingly, a recent study found that three year olds scored above chance in a similar task when asked which room to put candy in, but they did not score above chance when placing toys. These results may suggest that children learn how to prospect about

physiological needs/desires (like food) before psychological desires (such as avoiding boredom with toys) (Caza & tance, 2018)[0]. This study also found that children who solved the task correctly used more spontaneous task-relevant language about future and past events than children who didn't, suggesting that recording spontaneous speech may be another method for studying levels of prospection in young children.

Prospection in Middle Childhood

In the past five years or so, researchers have expanded the study of the development of prospection to include older children, but there have only been a few studies published about this age group (see review (Ghetti & Coughlin, 2018)[1]).

One of the first studies to examine episodic prospection in middle childhood asked Chinese immigrant and European-merican seven-to-10 year olds to recall specific past events (one recent and one from when they were little) and to imagine two specific future events (one soon and one when they were grown up) (Q. Wang, Capous, Koh, & Hou, 2014)[32]. The researchers compared data from these child participants with data they had collected previously from European-merican and Chinese young adults (Q. Wang, Hou, Tang, & Wiprovnick, 2011)[52].

The results showed that, although children used more specific details—"episodic information directly related to the central event"—than general details—"nonepisodic, external information"—for past and future events, they also used a higher proportion of general details compared to adults, especially when talking about future events. For example, when asked to describe an upcoming trip, a child might respond with "I'm going to fly on an airplane next Wednesday and go

to Disneyland" (specific, episodic details) as well as "They live in Minnesota in the summer and Florida in the winter"(general, non-episodic information).

This finding sheds light on how the mind develops with age. It suggests that general knowledge plays a bigger role in mental time travel for children than for adults—both for traveling back in time and in imagining the future—which means that children may have more difficulty both remembering and imagining a rich level of detail about a specific time and place. (In addition, the study found that children who included more specific details also included more general details, unlike for adults.) Because this increased general-to-specific ratio in children was consistent across genders and cultures, the researchers speculate that this ratio may reflect a developmental neurocognitive process—i.e., it may be easier for children to come up with general details when imagining the future than to think of details that are specific to a particular personal event. Ultimately, they argue that this supports what they call their "constructive-episodic-simulation" hypothesis—the idea that simulating a future episode requires a cognitive system that can recombine specific details of past events in a flexible manner—an ability, like many other cognitive abilities, that develops over the course of childhood. Notably, as we'll see later, old age is another time when people tend to rely more on general details when engaging in mental time travel, perhaps due to a decline in cognitive functioning (ddis, Wong, & Schacter, 2008)[501].

Interestingly, this study didn't find age differences in prospection within the group of children (e.g. seven and ten year olds used similar amounts of detail), suggesting that this middle childhood time period may be a relatively stable

period developmentally. However, a different study of adults and five-, seven-, and nine-year-old children found that the amount of specific detail provided for both past and future events increased throughout middle childhood. This study also found that future events were less detailed and more difficult for the children to imagine than past events (Coughlin, Lyons, & Ghetti, 2014)[28].

Similar results were found in a follow-up study of five to 11 year olds and adults (Coughlin, Robins, & Ghetti, 2017)[4]. Younger children had more difficulty coming up with a future event and required more prompts to do so.

Additionally, this study found that children with a more coherent self-concept (“a consistent and organized set of beliefs about their traits, abilities, values, and other personal characteristics”) produced richer descriptions of a future event, which suggests that a coherent self-concept helps children focus their search for personalized detail on information from their memory.

Prospection in Adulthood

There is some evidence to suggest that prospection ability isn't static in adulthood, either. One study found that the ability to create detailed descriptions of past and future episodes increased during development, peaking in young adults (around age 21)—and then declined again with age (Bram, Picard, Navarro, & Piolino, 2014)[31].

Another study found that older adults produced both past and future narratives with fewer episodic (specific) details than did younger adults (Caddis et al., 2008)[501]. This study also found a correlation between adults' use of episodic details in these stories and their relational memory abilities (remembering the associations and relationships between different pieces of information), suggesting that relational memory is probably a vital process in both remembering the past and imagining the future, “likely supporting the reintegration of details for remembering past events and the recombination of details for imagining novel future events.”



Functions of Prospection

Being able to imagine our future is such an important part of human life that it's difficult to imagine how we would function without it. This chapter will describe how prospection helps us navigate our environment, make decisions, reach our goals, have better relationships, behave with kindness toward others, and pursue happiness.

Prospection Helps Us Navigate Our Environment

Research suggests that prospection plays a vital role in navigation, both for humans and for other animals, such as rats. This research dates back to the 1940s when psychologist Edward Tolman hypothesized that humans and rats have cognitive maps—internalized spatial models of the environment—which they use to navigate the world and decide the best way to get from here to there.

Tolman came up with this theory based on his experiments showing that rats could predict which part of a maze contained food based not on the route that they had taken previously to get to the food (e.g. left, left, left, right) but on the actual location where they had found the food (Tolman, 1948)[6523]. For example, Tolman trained rats on a maze that had food in the upper right corner. This maze required them to go straight, turn left, go straight, and then turn right to get the food. When the maze was then replaced by another maze that had the original path blocked off and instead had a series of diagonal paths radiating from the center, the rats chose to take the diagonal path that led directly to the spot where the food had been in the previous

maze. This finding suggests that the rats created a cognitive map of the location of the food relative to their spatial environment (the room in which they were performing the experiment).

Work from the previous few decades tells us that Tolman was right: Rats have “place cells” in their hippocampus and “grid cells” in their endorhinal cortex that make spatial maps of the rat’s environment (for a review of this work see (Moser, Kropff, & Moser, 2008)[1265]). Furthermore, this work shows that hippocampal place cells can fire prospectively—meaning that they encode information about where the rat plans to go (Inge, Tamosiunaite, Wörgötter, & Dudchenko, 2012)[29]. In fact, one study found that when rats reached a decision point in a maze there was alternating activation in the place cells representing the two potential pathways, allowing the rat to simulate possible routes without physically trying them out (Johnson & Redish, 2007)[652].

What about humans? Research suggests that we too rely on prospective spatial coding in our hippocampus to navigate our environment. One fMRI study that asked participants to navigate toward a particular landmark in a video simulation found that certain patterns of activity in

the hippocampus corresponded to the location of that landmark while others corresponded to landmarks along the way toward their final destination (T. I. Brown et al., 2016)[66].

Additionally, this activity in the hippocampus correlated with activity in goal-related regions of the prefrontal cortex, suggesting that when we are engaged in goal-related planning, our brains can simulate potential ways of navigating our world that would allow us to reach our goals.

Another study may point to the neuroscientific basis for why some people are better navigators than others (Sormaz et al., 2017)[10]. This study found that individual differences in connectivity between the hippocampus and different cortical regions were associated with varying ability to remember conceptual vs. spatial information. Specifically, evidence suggests that stronger connections between the left anterior hippocampus and semantic regions may predispose people to being better at remembering conceptual information, whereas strong connections between the posterior hippocampus and the visual cortex may predispose people to have better memory for how objects are arranged in space. Because memory is so closely tied to prospection, these differences may also apply to differences in prospection abilities—i.e., some people may be better at imagining the route to get from point A to B, whereas others might be better at making more detailed conceptual simulations, such as predicting what the site of a particular event might look like, what might happen there, and who might be there.

Prospection Helps Us Make Decisions

Perhaps one of the most fundamental and important functions of prospection is that it

allows us to decide how to act: Thinking about what the future likely holds helps us decide what course to take in the here-and-now. Several studies have examined how thinking about the future shapes our decision-making.

Deciding between now and later

Researchers have been particularly interested in the psychology of “intertemporal choice”—deciding between receiving something now versus receiving something of greater value later. In general people tend to pass over choices that would benefit them more in the long run in favor of choices that offer smaller but more immediate rewards, a phenomenon known as “delay discounting” (we mentally discount benefits that require a delay).

Studies examining the role of prospection in intertemporal choice have made some fascinating findings. For instance, one set of five experiments found that people who felt psychologically closer to their future selves did less delay discounting; they were more willing to wait for a larger reward further in the future. On the flip side, when participants “anticipated large changes in psychological connectedness” between themselves and their future selves or between a fictional character and the character’s future self (which could occur due to a religious conversion or returning home after being in war, for instance), they were less patient and wanted the smaller amount sooner (Bartels & Rips, 2010)[205].

Another study that looked at both natural variations and experimental manipulations of connectedness with participants’ future selves found that feeling less connected to one’s future self meant that participants were more likely to prefer sooner, smaller-valued gift cards over larger-valued, delayed gift cards and were less

likely to wait for a computer to drop in price before hypothetically buying it (Bartels & Urminsky, 2011)[204]. Still another study found that feeling more connected to one's future self could help motivate people to make more far-sighted choices, such as not buying an optional item and saving their money; however, this far-sightedness only occurred when people explicitly considered the opportunity costs involved (i.e. buying this \$14.99 DVD means I don't have \$14.99 to spend on something else) (Bartels & Urminsky, 2015)[58].

Other studies have found that vividly imagining a possible future event can counteract delay discounting. For example, in one study from the United Kingdom, participants were told either to vividly imagine spending 35 pounds at a pub 180 days from now or to simply estimate what they thought could be purchased for 35 pounds (Benoit, Gilbert, & Burgess, 2011)[313]. Participants in the former condition showed an increased willingness to wait for a larger future reward than the participants in the latter condition. In other words, visualizing a specific possible future counteracted the effects of delay discounting. As the authors write, "the human faculty of envisaging possible future scenarios seems to serve an adaptive function: it effectively motivates decisions in the present which will only be advantageous in the future." Further support for this idea comes from a German study in which participants had to repeatedly choose between receiving 20 euros now or a larger amount at some later date (Peters & Büchel, 2010)[566]. When the future date included a tag about the participants' real-life plans for that future date (such as 45 days-Paris vacation), they were more likely to choose the delay option, presumably because this information primed them to think about the prospective future date in more detail.

Why might this priming effect occur? Results from another study suggest that imagining a future event may change how we represent the time difference between today and that event. This study found that participants who rated a future date as being relatively closer to the present day displayed less delay discounting than those who felt like that same date was further off (Thorstad, Nie, & Wolff, 2015)[0]. Intriguingly, an earlier study found less delay discounting when dates were presented in a numerical format ("08-23-22") versus written out as the amount of time from now ("four years from now"), possibly because people failed to conceptualize the length of delay in the first scenario (Read, Frederick, Orsel, & Rahman, 2005)[211]. It may be that representing a date as closer versus further away affects delay discounting through changing our perception of psychological closeness—i.e., if we perceive a particular time point as being less temporally distant, we may feel psychologically closer to our future self.

This research could have important personal and psychological ramifications. For instance, if people could feel a more immediate connection to their eventual retirement (and consequent drop in income), they may be more motivated to do something about it. In fact, one study found that manipulating how people think about the time until their retirement—by presenting the time until they plan to retire in days rather than years—caused them to plan to start saving for retirement sooner; the researchers determined that this was because the shift in time perspective made the participants feel more connected to their future selves (Lewis & Oyserman, 2015)[39]. Another study found that increasing the connection that people felt with their future selves—by viewing realistic computer-generated images of

what they may look like in the future—decreased their discounting of future rewards and led them to contribute more to a hypothetical retirement account (Hershfield et al., 2011) [373]. (Other researchers have found that, when it comes to saving for retirement, the effects of delay discounting can be offset not only by manipulating how people experience time but by “nudging” them toward more sensible, responsible choices. Economists Richard Thaler and Shlomo Benartzi have found two ways to successfully counteract the psychological barriers to saving for retirement: automatically enrolling employees in retirement accounts and asking them to agree to increase their contribution amount in the future (Thaler & Benartzi, 2004)[2289] (Benartzi & Thaler, 2013)[142].)

Yet there is also likely natural individual variation in the extent to which people engage in delay discounting. For example, one recent study found that people who are steeper delay discounters—those who prefer smaller, more immediate rewards over larger, delayed rewards—also appear to be less reflective (Shenhav, Rand, & Greene, 2017)[11]. These people failed to optimize their probability for winning in laboratory economic tests, they scored higher on the Need for Cognitive Closure survey, they preferred short-form social media over long-form (Twitter over Reddit), they preferred other news sources over National Public Radio, they “were more likely to believe that the behavior of others could be explained by fixed rather than dynamic factors” (e.g. they believed more in racial stereotypes—which could be seen as relying more on easy mental shortcuts), and they believed more strongly in God and an afterlife. The researchers speculate that the latter two findings could be due to these beliefs being more intuitive—at least in American culture—or

because these beliefs provide a sort of immediate cognitive reward that not believing in God or the afterlife fails to offer.

Why might all these attributes go together? The authors argue that these may all be examples that follow “naturally from a dual-process framework for understanding judgment and decision-making.” Specifically, some people give more weight to automatic and intuitive processing more than others, and these people are more likely to favor short-term rewards. Other people prefer more controlled and reflected processes and are thus more likely to favor larger, delayed rewards. Some psychologists have argued that both forms of human cognition—the more automatic and the more cognitive/deliberative—can be adaptive for human populations as well as individual humans: While deliberative processing may be more flexible, it also takes longer and is more energy intensive (Tomlin, Rand, Ludvig, & Cohen, 2015)[19].

study that used computer modeling to test out these predictions found that cognitive/deliberative processing is successful early on, but “its initial spread can produce conditions that undermine its further evolution, and in some cases bring about its collapse.” In other words, human populations may require a mix of types of people—those who may quickly choose a nearer-term, smaller reward and those who tend to think things through and wait for bigger rewards—for humanity’s very survival (Toupo, Strogatz, Cohen, & Rand, 2015)[19].

Wise reason is a psychological distance
Of course, making a decision is often more complicated than choosing between 10 dollars now and 100 dollars next year. Contemplating more complicated decisions often involves weighing a

wealth of different information and opinions, and studies have found that the perspective people take on their decisions may lead them to make smarter choices. For instance, research suggests that thinking about their situation in the third-person may help people engage in wiser reasoning about possible future events—i.e., they adopt more of a big-picture perspective, rather than be swayed by emotionally salient details.

In one study, college students who were asked to reason aloud about how an economic recession might impact their lives showed wiser reasoning (they were more likely to “recognize the limits of their knowledge and recognize the future was going to change”) if they reasoned aloud from a “distanced perspective” (imagining the events unfolding “as if you were a distant observer”) than from an “immersed perspective” (imagining the events unfolding “before your own eyes as if you were right there”) (Kross & Grossmann, 2012) [145]. A similar effect occurred in a second experiment, in which very liberal and very conservative students in the United States imagined the impact of their candidate losing from a distanced (pretending they were an Icelandic citizen) or immersed (pretending they were a U.S. citizen) perspective. Additionally, participants from the distanced group less strongly endorsed their political views after the experiment and were more likely to sign up to join a bipartisan group that discussed political issues.

Psychological distance might help explain why we are often wiser when considering other people’s futures than our own. For instance, one study found that people demonstrated wiser reasoning when thinking about the ramifications of their friend’s romantic partner being unfaithful than they were when imagining their

own partner’s infidelity (Grossmann & Kross, 2014)[82]. This discrepancy went away when participants were asked to think about their own situation from a third-person perspective. Such findings suggest that increasing self-distance may make people think more wisely when they consider their personal futures.

A more recent study suggests that the role of self-distancing may be more complicated when it comes to considering how the future developments of a political issue may influence society in general (Grossmann, Sahdra, & Ciarrochi, 2016)[34]. This study found that self-distancing did induce wiser reasoning when participants were asked to prospect about hot-button political issues: It made people more intellectually humble and allowed them to better recognize that the world is in flux and that there are different perspectives. But this was only true for a subset of participants, namely those with high heart rate variability (HRV), a marker of superior cognitive functioning.

Thus, even though people with high HRV have stronger cognitive skills—which suggests that they would be better able to engage in wise reasoning—they still benefit from being prompted to take a more distanced perspective. Perhaps this may help explain the results of another study, which found that people varied in the extent to which they engaged in wise reasoning from day-to-day (Grossmann, Gerlach, & Denissen, 2016)[43]. It could be that some situations make it easier to take on a more distanced perspective, while others require more of an active attempt to do so.

Temporal horizons, future-oriented thinking, and decision-making

A different set of studies suggests that people who tend to think further into the future (they

have a longer temporal horizon) make more future-oriented decisions. For example, one study that analyzed the language in tweets from all 50 United States found that states whose tweeting residents displayed longer temporal horizons (their tweets contained more mentions of further off time periods, such as “next year” versus “tomorrow”) also had lower rates of risky decisions, such as cigarette smoking or not wearing a seatbelt (Thorstad & Wolff, 2016)[0]. The researchers also found that individuals whose tweets showed they had a longer temporal horizon were more willing to wait for future rewards (they showed less delay discounting), and they also took fewer risks in a video game that involved blowing up balloons.

Results from a recent study that expanded this work found evidence that an individual’s level of future-sightedness (their temporal horizon) is both a stable cognitive trait (e.g., their tweets tended to show the same future-sightedness over time) and is likely also a state (within a particular person’s tweets, the closer together the tweets were in time, the more similar their level of future-sightedness was) (Thorstad & Wolff, 2018)[3].

This study also found that people who tend to think (and tweet) more about the distant future, as opposed to the nearer future, also make more future-oriented choices in the present. “Thinking far into the future leads people to see the present as more associated with the future,” write the researchers.

In contrast, this study also found that people who tweeted more about the future (they were more future-oriented) also made riskier decisions. Why might this be? “The reason why a tendency toward the future might be associated with risk taking,” write the researchers, “is because those who tend to think about the future

will tend to focus on the near future, which in the case of risks, involves focusing on the rewards, likely promoting risk taking.”

Prospection Motivates Us to Work

Toward Our Goals

Besides helping us to weigh options and make decisions, research suggests that prospection has another important application: It motivates us to achieve our goals. Many of these studies have been led by psychologist Gabriele Oettingen.

Interestingly, and perhaps counterintuitively, research has found that the more people positively fantasize (think and picture a desired future) about successfully reaching their goals, the less effort they actually put into realizing them. For example, one of Oettingen’s studies found that the people who fantasized more positively about successfully losing weight lost less weight (Oettingen & Wadden, 1991)[116], and another study found that students who fantasized more about their transition into a professional career were less successful in their job search (Oettingen & Mayer, 2002)[511].

Importantly, both of these studies found the opposite effect for positive expectations (“judging a desired future as likely”). “Positive expectations reflect past successes, they signal that investment in the future will pay off,” write Oettingen and Klaus Michael Reininger in a recent review (Oettingen & Reininger, 2016)[8]. “Positive fantasies, to the contrary, lead people to mentally enjoy the desired future in the here and now, and thus curb investment and future success.” Subsequent unpublished studies have found evidence for this idea that fantasies let people obtain mental rewards in the near term, and these rewards dampen their desires to take

action toward making their fantasies a reality in the long term (Oettingen & Reininger, 2016)[8].

But often our goals come from our fantasies. We may fantasize about running a marathon, meeting the right partner, or landing a dream job. But how do we turn these fantasies into goal-directed behavior? Research suggests that the answer lies in contrasting our fantasies with our current reality, allowing us to see elements of our current situation as barriers that can be overcome. For example, a study of students in a vocational training program found that asking students to mentally contrast their positive fantasies about benefiting from the training program with aspects of the program that may impede their progress committed themselves to the program in concert with their expectations—i.e., those who expected to do well committed themselves more, and those who expected to do poorly committed themselves less (Oettingen, Mayer, Thorpe, Janetzke, & Lorenz, 2005)[128]. Expectations did not change commitment levels in participants who were not assigned to contrast their present situation with their future desires. A later study found evidence that the effectiveness of mental contrasting is due to “energization”—meaning that, when people have high expectations for succeeding at something, considering the aspects of their current reality that may impede their goals gives them energy to try to overcome those barriers (Oettingen et al., 2009)[155].

Multiple studies have found that mental contrasting, particularly when used in conjunction with “implementation intentions” (making plans to help move past potential barriers to goal-achievement), can help people reach their goals (for review see (Oettingen & Reininger, 2016)[8]). For instance, Mental Contrasting with

Implementation Intentions (MCII) interventions have helped people break a bad snacking habit (Driaanse et al., 2010)[164] and develop better exercise and eating habits (Stadler, Oettingen, & Gollwitzer, 2009)[159] (Marquardt, Oettingen, Gollwitzer, Sheeran, & Liepert, 2017)[7], and have improved grades and attendance in fifth graders from low-income homes (Duckworth, Kirby, Gollwitzer, & Oettingen, 2013)[97].

Teaching MCII “helped people to gain insight into their daily lives, prioritize their goals, and fulfill their wishes,” write Oettingen and Reininger (Oettingen & Reininger, 2016)[8]. “It benefitted people across age groups and from different backgrounds and countries.”

Thus, research suggests that thinking about the future—even engaging in fantasies about it—can motivate us to take the steps necessary to reach our goals, but only if we take into account the obstacles we may need to surmount to get there.

Prospection Improves Relationships

The benefits of prosppection do not seem to be limited to one’s personal goals, achievements; there may be social benefits as well.

For instance, according to one study, adopting a more future-oriented view about one’s relationship conflicts may improve that relationship. In this study, some participants were asked to shift their temporal orientation about a particular unresolved conflict they were having with their romantic partner or close friend by reflecting on what they thought they would think of the conflict one year from now. Compared with participants who didn’t think ahead like this, the future-oriented participants expressed more “adaptive reasoning” about the conflict: They blamed their partner less, showed greater

insight about how the conflict impacted their relationship in constructive and positive ways, and demonstrated greater forgiveness (Huynh, Yang, & Grossmann, 2016)[18]. In turn, this shift in how they processed the conflict was associated with better relationship outcomes, such as feeling more positive emotions about the relationship and expecting that the relationship would grow.

The researchers determined that this effect could be explained by a decrease in being “person-focused.” When participants took the future view, they used fewer first-person singular and third-person singular pronouns in their narratives about the conflict, suggesting that they were more focused on the relationship as a whole than on themselves and their partner as individuals.

These results “demonstrate that adopting a future-oriented perspective over a relationship conflict—reflecting on how one might feel a year from now—can shift one’s post-conflict reasoning away from individual agents and partner blame to greater insight and forgiveness,” write the researchers. “This change in reasoning is in turn associated with greater relationship well-being.”

Prospection Can Make Us More Prosocial

How we think about the future can influence our prosociality—the extent to which we are cooperative, kind, and generous to others—sometimes in unexpected ways.

For example, one study found that people who felt less connected to their future selves (because they anticipated large personal changes) volunteered to give away more money to charity in one week than did people who felt more connected to their future selves (Bartels, Kvaran, & Nichols, 2013)[35]. And in cases where they felt closer to certain people than they felt

to their future selves, they gave more money to those other people. Why might this be? “Our explanation for this effect is that when the future self is regarded as disconnected, people place less weight on the interests of the future self,” write the researchers.

Other studies have examined how imagining the future can influence prosociality (Gaesser & Schacter, 2014)[62](Gaesser, Horn, & Young, 2015)[12]. For instance, one set of experiments found that participants who were asked to imagine helping someone were more willing to actually help the person in a later survey—and this effect was even stronger when people were asked to imagine the helping scenario more vividly. Additionally, one experiment found that people who imagined helping actually gave more money to people in need when given the opportunity (Gaesser, Keeler, & Young, 2018)[3].

Another study by this group also found that simulating helping people increased participants’ later intentions to actually help (Gaesser, Dodds, & Schacter, 2017)[5]. In addition, it showed some interesting age-specific effects: Both older (65-86) and younger (18-27) adults were more prosocial after they imagined helping someone than they were at the start of the study. However, the younger people were also significantly more prosocial after they imagined helping someone than they were after a more conceptual exercise of simply writing down how people could be helped, whereas there was not a difference between those two conditions for the older people. The researchers note that this could be related to a general switch to a conceptual mode of thinking that older adults could have been using in both conditions.

Another study found that thinking more broadly about the meaning and consequences

that could come from helping others might inspire more prosocial behavior (Knin, Van Boven, & Johnson-Graham, 2015)[8]. In this experiment, researchers divided participants who had volunteered to travel to New Orleans for Hurricane Katrina relief efforts into two groups. Both groups were asked to imagine their future trip, but one group was asked to do so with concrete details (imagining specifically what they would do and how they would do it) while the other was asked to think more abstractly and to focus on “the general, global meaning of your efforts in New Orleans, including the abstract meaning and the consequences it could have.” Participants in the abstract group predicted that their trip would be more rewarding than participants in the concrete group.

second experiment asked participants to imagine that they were given 10 dollars and could give some of that money to a stranger. But the experimenters told the participants that how much money they would choose to give to the other person had been pre-determined: Half the participants were told they would give \$7 and the other half were told \$3. The experimenters also asked the participants to think about their (pre-determined) decision from a concrete perspective (“exactly what they might think about, as well as the specific contents of their thoughts and feelings”) while the other participants were asked to think about their (pre-determined) decision from an abstract perspective (“consider the importance and meaning of their decision, how this decision fits into their life’s past and future experiences, and how they would feel when looking back on this decision later in life”). The results showed that, compared to people in the concrete view group, the participants who were asked to adopt the abstract view forecasted that giving more

money to the stranger would make them happier. These results “suggest that people are more likely to appreciate the emotional benefits of prosocial actions when they adopt high-level construals than when they adopt low-level construals.”

Could this effect have real-world consequences? The researchers think so: “We believe that our results suggest an intervention that could be used to prompt and sustain prosocial behavior. To the extent that people avoid or cease prosocial actions because of concrete costs, inviting people to construe those actions abstractly could help them persist at prosocial actions that have enduring personal and social benefits.”

Prospection Helps Us Pursue Happiness **(lbeit Imperfectly)**

The previous section provided a glimpse into how we can change the way we feel in the present by thinking about what we’ll feel in the future. In fact, this phenomenon of thinking about our future feelings has produced its own body of research and literature, called “affective forecasting.” In *Homo Prospectus*, Roy Baumeister proposes the notion that “actions are often guided (and guided well) by prospective hedonics—by forecasting how one will feel in the future” (Seligman et al., 2016)[87](p.213). This idea is supported by studies conducted by Baumeister and others.

For example, one particularly creative study found that when participants were told that they had taken a pill that froze their mood for one hour (actually a placebo), people who were sad and people who were happy ate roughly the same amount of snacks (Tice, Bratslavsky, & Baumeister, 2001)[1194]. However, when participants believed that their moods were changeable,

the sad participants ate more snacks, presumably because they thought it would make them feel better.

second study found that people who were primed to value catharsis responded more aggressively when insulted, but the “mood-freezing” pill eliminated this effect. (Bushman, Baumeister, & Phillips, 2001)[555]. Thus, when people anticipated that there would be no catharsis from trying to get revenge on someone who had angered them, they chose not to act aggressively. This evidence supports Baumeister’s theory that people tend to base their actions on what they think will make them happy in the future.

Errors of affective forecasting

However, ample research suggests that when people think about how they are likely to feel in the future, they don’t always make correct (or even reasonable) predictions. In fact, research shows us that the mental simulations people make concerning how they will feel in the future routinely suffer from one of four errors: Their simulations are unrepresentative, essentialized, abbreviated, or decontextualized (Gilbert & Wilson, 2007)[950]. These four errors will be briefly discussed below.

- *Simulations are unrepresentative*

As we saw in the mechanisms chapter, research suggests that our prospectives—our simulations of what the future might be like—are based off our memories. However, research also suggests that memory is far from infallible—it can be selective and it can change with time. Thus, if the building blocks of prospecting aren’t representative of real life, our simulations of the future likely won’t be either.

series of interesting studies highlights this particular error of prospecting. In one study, participants who were asked to imagine how it would feel to miss a train in the future tended to remember the worst time they had missed a train and thus overestimated how painful their next missed train would be (Morewedge, Gilbert, & Wilson, 2005)[191]. Participants in another study had one hand submerged in cold water for 60 seconds and the other later submerged in cold water for 60 seconds but then gradually warmed for an additional 30 seconds. When given the choice of which condition they wanted to repeat, a majority chose the later longer trial, despite the fact that it was more painful for a longer period of time, presumably because they remembered the warm water at the end (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993)[1289].

“It seems that everyone remembers their best day, their worst day, and their yesterday,” as Gilbert and Wilson put it in their review. “Because unusual events and recent events are so memorable, people tend to use them when constructing simulations of future events.”

- *Simulations are essentialized*

The second common error of prospecting occurs because people tend to focus on the essential features of an experience—what they consider to be most important (e.g., I’m going to see my best friend get married next year)—while ignoring the inessential ones—features they may consider to be less important (e.g., I’m going to need a ride to the airport). According to researchers, the essential features of an experience become more salient the further out people prospect, so that sways their predictions for the future.

For example, when participants in one study were told about two lectures that would be held one year from now, an interesting lecture in an inconvenient location and a less interesting lecture in a more convenient location, they were more likely to predict that they would attend the interesting lecture. However, other participants who were given the same choices for a lecture occurring tomorrow tended to choose the more convenient but more boring lecture (Trope & Liberman, 2003)[3129]. In the former case, the participants focused on the essential information (the topic of the lecture) and deemphasized the less essential information (the location of the lecture). However, for the latter participants the location of tomorrow's lecture felt like more salient information and thus their prospectives included both the essential and inessential information, which influenced their decision-making.

"The fact that simulations of far-future events are especially likely to omit inessential features is one of the reasons why people so often make future commitments that they regret when the time to fulfill them arrives," write Wilson and Gilbert.

- *Simulations are abbreviated*

When we think about a possible future event, we don't think of every single moment of the event. We tend to just think of a few standout or characteristic moments. Particularly when it comes to imagining what our lives would be like after a big change, such as winning the lottery or becoming paralyzed, we tend to focus on how we would feel in the early moments, meaning that moments of intense pain and pleasure are overrepresented in these simulations. This, in turn, leads people to underestimate how well they might adapt to situations over time.

For example, one study found that healthy people and people with kidney disease who required dialysis had similar levels of happiness, but healthy people's estimates of their mood if they were on dialysis were much lower than the actual patients' moods (Riis et al., 2005) [305]. Likewise, another study found that people overestimated how upset they would be two months after a breakup (Gilbert, Wilson, Pinel, Blumberg, & Wheatley, 1998)[1601].

"Because simulations tend to represent the early moments of future events, predictions based on them tend to ignore things that happen in the later moments," write Gilbert and Wilson.

- *Simulations are decontextualized*

When people predict how they will feel in the future, they tend to base these predictions on how they feel presently, ignoring ways in which the context of their situation could change. For example, one study found that participants who had just finished exercising—and thus were thirsty—anticipated enjoying drinking water the following day more than people who were about to exercise (Van Boven & Loewenstein, 2003)[419], and a study found a similar effect when hungry and non-hungry people were asked how much they would enjoy eating spaghetti for breakfast or dinner the next day (Gilbert, Gill, & Wilson, 2002)[373]. However, another study found that when people are asked to consider contextual factors when making their predictions, such as how well they might adapt to a given situation, they made more accurate predictions (Ubel, Loewenstein, & Jepson, 2005)[183].

*The value of affective forecasting,
despite its errors*

So how does Baumeister's theory that actions are guided by anticipated emotions jibe with the work by Gilbert and others suggesting that people are often misguided about how they will actually feel in the future?

Baumeister suggests in *Homo Prospectus* that the two ideas are not actually at odds. He points out that people often mispredict how they will feel but not in a way that would make acting on those anticipated emotions foolhardy. For example, he mentions that the "main error is an overestimation of how long the emotion will last."

Baumeister also argues that "it is likely adaptive for people to overestimate their future emotional

state." He cites an example from one of Gilbert's studies which found that professors overestimated how upset they would feel when denied tenure. If an assistant professor believes that not getting tenure would make them completely miserable for a long time, they'd be more likely to work hard to avoid such an outcome. Writes Baumeister: "Motivating oneself based on anticipated emotion is the main point. It makes one do the best work one can. By the time the tenure decision arrives, the emotion has served its function. If the young professor does end up failing to get tenure, there is no particular advantage in being miserable for years afterward."



Dysfunctional Propection

As we've seen, propection has some powerful functions: It can help us navigate our way around the world, encourage us to make wiser and more prudent decisions, and inspire us to act more generously. However, sometimes propection goes awry. People don't always think about the future in ways that are good for their mental health, and a growing body of work suggests that deficits in propection can contribute to—and sometimes be the source of—symptoms for a whole host of conditions, including depression, anxiety, ADHD, and addiction.

Depression

In *Homo Prospectus*, psychologists Martin Seligman and Anne Marie Roepke argue that dysfunctional propection causes depression (Seligman et al., 2016)[87], an argument that they build off of Aaron Beck's negative cognitive triad (the idea that the hallmark symptoms of depression include negative views of the world, of the self, and of the future) (Beck, Rush, Shaw, & Emery, 1979)[19658].

“We see faulty propection as a core underlying process that drives depression (and potentially contributes to a range of other comorbid disorders),” they write. They posit that propection is the “process that belongs front and center in the study of depression.” In particular, they point to the importance of studying the three faults of depressive propection: misguided simulation of possible futures, pessimistic evaluation of possible futures, and negative beliefs about the future.

Simulation of possible futures

Research suggests that people with depression simulate possible futures that are more negative and less positive than people without depression. In particular, studies have found that: adults with depression “were faster to provide specific examples of negative events relative to positive events” (MacLeod & Cropley, 1995)[62]; “depressed adolescents recalled more negative memories and anticipated more negative future experiences” (Miles, MacLeod, & Pote, 2004)[44]; adults with mild to moderate depression reported reduced anticipation for positive future events (Bjärehed, Sarkohi, & Andersson, 2010)[45]; and people with major depression provided less vivid positive prospective scenarios (Morina, Deepro, Pusowski, Schmid, & Holmes, 2011)[123].

These deficits in propection may be rooted in memory deficits, write Roepke and Seligman in a 2016 article (Roepke & Seligman, 2016)[37]: “Depressed people might struggle to imagine

a good future because they struggle to recall a good past.” Multiple studies have found that the memories of people with depression are less specific—particularly memories of positive events (Williams & Scott, 1988)[503](Dalgleish et al., 2007)[389](Williams et al., 1996)[561].

Evaluation of possible futures

How people evaluate the risk in possible futures can also be another form of dysfunctional prospection that research has linked to depression. “Depressed people tend to overestimate, over-weight, and over-attend to risk, and this produces more negative expectations about the future,” write Seligman and Roepke in *Homo Prospectus*.

Studies have also found that depressed people made more pessimistic predictions of the future (Lloy & Hrens, 1987) [381] and judged negative future events as being more likely and positive future events as being less likely—and gave more reasons for these predictions—than people without depression (MacLeod, Tata, Kentish, Carroll, & Hunter, 1997)[36].

In other studies, people with depression displayed “increased certainty about both the occurrence of negative outcomes and a lack of positive outcomes” (Miranda & Mennin, 2007) [107] although these predictions were unrealistically pessimistic (Strunk, Lopez, & DeRubeis, 2006)[183].

Furthermore, studies have found that people with depression reported feeling more hopeless about their power to change bad outcomes should they occur (Bramson, Garber, Edwards, & Seligman, 1978)[144] (Seligman, 1972)[942] (Kosnes, Whelan, O’Donovan, & McHugh, 2013) [29] and that people who have a strong belief that there won’t be positive events in their future are

at a high risk of having suicidal thoughts (Sargalska, Miranda, & Marroquín, 2011)[19].

Negative beliefs about the future

Seligman and Roepke propose that people with depression have a particular template for thinking about the future, which they call a “pessimistic predictive style.” This mirrors the “pessimistic explanatory style,” or PES, that people with depression tend to apply to past events (Lloy, Bramson, Metalsky, & Hartlage, 1988)[318]. People with PES explain past negative events in their lives as being due to “causes that are personal, pervasive, and permanent: Bad things happened because of one’s own shortcomings, which have poisoned all domains of life and always will” (as Seligman and Roepke put it) (Peterson & Seligman, 1984)[2149].

But, as Seligman and Roepke note, PES focuses on the past, and thus more work needs to be done to determine how having a pessimistic framework for viewing the future contributes to depression. They speculate that “a pessimistic predictive style should have the same features as PES: Depressive predictions about if-then sequences in the future are likely (a) pervasive, (b) permanent, and (c) personal (i.e., “if I don’t perform well on this test, then I’ll never succeed and I’ll die a failure”).”

How strongly is faulty prospection actually tied to depression ?

While Roepke and Seligman say that they don’t think that faulty prospection causes all depression symptoms—and poor prospection in itself is neither necessary nor sufficient for causing depression—they do hypothesize that faulty prospection is the “primary cause” of the

disorder. They also propose that faulty prospection “sets up a vicious cycle.” Namely, dysfunctional prospection produces depression, which in turn creates poorer prospection. This is because depression (a) causes people to have fewer positive experiences with which to construct positive future scenarios, (b) leads people to experience more stress and negative outcomes (such as interpersonal conflict), creating memories that people use to construct negative predictions of the future, and (c) produces a negative mood, which can itself reduce positive future thinking (O’Connor & Williams, 2014)[20].

Roepke and Seligman emphasize that it is not negative prospecting (“representations of an undesirable future”) themselves that are implicated in depression. These representations are “normal and often useful.” Instead, faulty or dysfunctional prospection is a pattern of “representations of the future in which negative content predominates and leads to significant impairment” (Seligman et al., 2016)[87].

Fortunately, if faulty prospection causes and/or exacerbates depression, then changing these prospecting may be one way to help people with depression. Indeed, as Seligman and Roepke note in their review, some cognitive behavioral therapy (CBT) approaches already target future-oriented thinking: “CBT therapists already have some future-oriented strategies in their quivers and these deserve to be formalized, extended, and grouped together” (Roepke & Seligman, 2016)[37]. (This topic will be further discussed in the Improving Prospection chapter.)

Unfortunately, depression isn’t the only disorder that appears to involve faulty prospection. Research suggests that anxiety, schizophrenia, attention-deficit/hyperactivity disorder

(DHD), and addiction may all involve some element of dysfunctional prospection (Hallford, Austin, Takano, & Raes, 2018)[4].

anxiety

While research on the link between prospection and depression is most common, there has also been significant research published on the connection between faulty prospection and anxiety. This makes sense, considering the strong overlap between depression and anxiety and the fact that one of the symptoms of anxiety is persistent worry.

Multiple studies have found similar deficits in prospection among people suffering from depression and those suffering from anxiety (MacLeod et al., 1997)[36](Miranda & Mennin, 2007)[107](Morina et al., 2011)[123](Miles et al., 2004)[44].

Additional research has examined what mechanisms may underlie faulty prospection in particular forms of anxiety. For example, studies of people with anxiety have found that people with social anxiety use social feedback to construe a less optimistic view of themselves than people without social anxiety (Koban et al., 2017)[8]. Studies have also found that fear of being negatively evaluated alters cognitive performance and memory in people with social anxiety (Maresh, Teachman, & Coan, 2017)[0], and that highly anxious people who tracked their emotional responses over time showed many negative biases, reported more negative average emotion over time, and responded more negatively to neutral events (Fua & Teachman, 2017)[0].

Interestingly, one recent study found that more anxious individuals relied more on remembering how emotional they felt during past events (“episodic retrieval”) rather than “just knowing”

how they felt, suggesting that “these individuals may have a larger reserve of salient and readily-accessible emotional episodes available in memory, and/or they may have a stronger and more well-rehearsed tendency to retrieve and mentally process the emotional aspects of past situations” (Gorlin et al., 2018)[0]. The researchers suggest that while highly anxious individuals may have strong memories of how they felt during a past event, this strength of recollection may not extend to other aspects of memory: “It may be that emotionally disordered individuals preferentially recall the details of their emotional states but not the other contextual aspects of the situations they encounter, which may lead to an incomplete and negatively skewed impression of such situations, thereby only further reinforcing their negative self-beliefs.” Since there is thought to be a strong relationship between memory and prospection, this finding may explain why people with anxiety tend to display faulty prospection (although this needs to be tested).

Schizophrenia

Though there hasn’t been evidence that faulty prospection can contribute to schizophrenia, a few studies have examined how schizophrenia may influence prospection. For example, one study found that people with schizophrenia had a more difficult time remembering specific past events than people without schizophrenia and had even greater deficits in generating possible specific future events (D’rgembeau, Raffard, & Van der Linden, 2008)[296]. The researchers note that these results may suggest that people with schizophrenia have a hard time retrieving contextual details from memory and may have an altered sense of subjective time.

Multiple recent studies have found that people with schizophrenia generate less detailed and less positive future events than people without schizophrenia (Chen et al., 2016)[3](Painter & Kring, 2016)[12](Raffard et al., 2016)[8]. And one experiment found that people with schizophrenia were less likely to select items that they would need to solve a future problem (and were less likely to actually use the required item) compared to people without the disorder (Lyons, Henry, Rendell, Robinson, & Suddendorf, 2016)[6].

Attention-Deficit/Hyperactivity Disorder

(DD/ DHD)

People with attention-deficit/hyperactivity disorder (DD/ DHD) can have difficulties planning for the future, and some recent work sheds light on some brain mechanisms that may underlie this difficulty. For example, one fMRI study of people with DHD found evidence of altered functional relationships, as well as structural differences, between large-scale brain networks, including the default mode network and other networks involved in prospection, compared with the brains of people without DHD (Kessler, ngstadt, Welsh, & Sripada, 2014)[47]. Another study found that the connections between these brain networks develop later in people with DHD than they do among other people, which could help explain the developmental delays—including in tasks that involve planning for one’s future—seen in children and adults with DHD (Sripada, Kessler, & ngstadt, 2014)[112].

Addiction

A few studies have found impaired prospection abilities in people with addiction. In particular, studies have found that long-term opiate users

have significant deficits in prospective memory—the ability to remember to perform necessary actions at specific points in the future (Terrett et al., 2014)[24]—and in episodic foresight, which is the “capacity to mentally travel forward in time” (Mercuri et al., 2015)[14] (Mercuri et al., 2016)[7].

In one study, long-term opiate users performed worse in a board game that required them to acquire items to solve a problem (and to later use these items) (Terrett et al., 2017) [6]. “Such lack of foresight may adversely affect daily functioning in this group in areas such as employment, finances and interpersonal relationships,” write the researchers.

However, it is important to note that at this point it is unclear whether drug addiction causes deficits in prospection or vice versa (or if a third factor could be responsible for both impairments). Interestingly, another study found that people who believe less in free will—“the ability to make free choices and to choose one’s own

actions, without unusual constraint”—were more likely to have a history of being addicted to drugs or alcohol, were less likely to have successfully quit using alcohol, and also had an increased perception that things are addictive (Vonasch, Clark, Lau, Vohs, & Baumeister, 2017) [10]. This is important because if people believe that their future actions are not within their control, this belief may undermine their ability to quit drugs, alcohol, or other addictions.

Other Disorders

Besides research on the disorders included above, studies have also drawn links between dysfunctional prospection and bipolar disorder (Boulanger, Lejeune, & Blairy, 2013)[11](King et al., 2011)[23], post-traumatic stress disorder (PTSD)(Kleim, Graham, Fihosy, Stott, & Ehlers, 2014)[36](. D. Brown et al., 2014)[68], and dementia (Irish & Piolino, 2016)[80].



Improving Proseption

The previous chapter discussed how dysfunctional proseption is a hallmark of several psychological disorders and pathologies. This section will discuss how particular techniques can be used to improve the symptoms of such disorders as well as to encourage overall psychological growth.

s touched on earlier, some techniques used in cognitive behavioral therapy (CBT) involve correcting how people think about the future, and some studies have shown that CBT can improve proseption (MacLeod et al., 1998)[75](Andersson, Sarkohi, Karlsson, Bjärehed, & Hesser, 2013)[10].

In a recent review, Roepke and Seligman point to four CBT techniques that target proseption: 1) changing people’s pessimistic predictions, such as by using the Socratic method to correct the cognitive errors of fortune-telling (predicting that something negative will happen without realistically considering the odds of that thing happening) and “catastrophizing” (imagining the worst possible outcome); 2) training people on planning and goal-setting strategies (which are inherently directed toward the future); 3) having them rehearse how they will deal with possible obstacles in the future; and 4) encouraging them to “schedule pleasant, mastery-inducing experiences in the future,” which are opportunities that allow people to experience success and grow their feelings of self-efficacy (Roepke & Seligman, 2016) [37]. Such new positive experiences can provide fuel for future positive proseptions. Seligman and Roepke also note that CBT can help people indirectly develop healthier proseption via instilling hope and encouraging people to focus more on the present and the future rather than the past.

Besides traditional CBT, psychologists have developed various treatment packages that are explicitly future-oriented. For example, future-directed therapy is a 10-week program for reducing depression symptoms by creating a paradigm shift that induces people to spend less time dwelling on the past or current struggles and more time thinking about what they want from the future—and developing skills to reach those goals (Vilhauer et al., 2012)[47]. nonrandomized pilot found that patients with major depressive disorder who completed this intervention showed significant improvements in depression, anxiety, and quality of life. They also showed greater improvements in depression than patients who completed standard CBT.

another future-directed type of therapy is hope therapy. randomized controlled eight-session trial of hope therapy, which emphasizes building goal-pursuit skills, found that participants assigned to the hope therapy group demonstrated statistically significant improvements in hope, meaning in life, self-esteem, depression, and anxiety (Cheavens, Feldman, Gum, Michael, & Snyder, 2006)[326].

Solution-focused therapy is yet another technique, which is “characterized by optimism, an appreciation of the clients’ competence to manage their lives and a future, goal-oriented self-enhancement process,” and has been found to improve outcomes for people who called a suicide hotline (Rhee, Merbaum, Strube, & Self, 2005)[43] and people seeking treatment for substance abuse (Smock et al., 2008) [96].

Roepke and Seligman also note other promising future-oriented therapy techniques that could be built into CBT to improve client outcomes (Roepke & Seligman, 2016)[37]. These include route-based imagery (“identifying behaviors, thoughts, or feelings that lead to the desired outcome”), manipulations of time perspective (helping “clients to relax deeply and then to project themselves into the future and vividly imagine rewarding experiences”), anticipatory savoring (teaching clients how to look forward to events, such as by making a list of three good things they expect to happen tomorrow), and building purpose (helping clients identify their highest values and guiding them to take on projects consistent with those values).

recent study suggests that prospective writing might encourage post-traumatic growth (PTG), which is positive psychological growth following a traumatic life event. In this study, adults who had recently experienced an adverse event were randomly assigned to a prospective writing intervention group, a factual writing control group, or a no writing control group (Roepke, Benson, Tsukayama, & Yaden, 2017) [0]. Participants in the prospective writing inter-

vention group were prompted to write for 15 minutes once a week for a month about “whatever comes to mind about the new opportunities or ‘new doors’ that have opened, or might open.” Participants in the factual writing group wrote about whatever facts they could remember about the events of the last 24 hours (focusing on the who, what, when, and where).

Results showed that clients in the prospective writing group experienced greater current-standing PTG over time compared to both control groups, meaning that their ratings for how well they were doing currently in the five domains of PTG (relationship quality, meaning in life, life satisfaction, gratitude, and religiosity-spirituality) improved throughout the study. However, there was not a difference between the prospective intervention group and the no-writing control group when it came to another measurement of PTG, retrospective growth, which asks participants to report how much they feel they have grown in the five PTG domains between the time before their trauma and the current moment. The researchers note that this discrepancy may be due to people having difficulty accurately recalling and assessing changes in PTG retroactively.

While this work is preliminary, this study “suggests that focusing on new doors opening could be an important tool for individuals to use in order to foster psychological growth and well-being in the wake of adversity,” write the researchers. “Prospective writing may facilitate this process by encouraging people to notice and explore new opportunities that already exist in daily life.”



Limitations and Future Directions

This paper is intended to provide an overview of the science of prospection, broadly defined. However, given the breadth and sometimes nebulous nature of the subject, some topics that are arguably related to prospection have been glossed over, a clear limitation of this paper. It does not delve into the interplay between future-mindedness and free will, for example, or between future-mindedness and consciousness, or into some psychological topics that intrinsically involve the future, such as perception, self-control, and optimism, or into to what extent animals other than humans demonstrate an ability to consider the future.

Despite these omissions, what is clear is that the science of prospection (or future-mindedness)—as conceptualized by Seligman and colleagues—is increasingly an interdisciplinary area of interest with many questions left to be explored. Below we will present a few of these promising future directions.

Future Directions

Basic questions about the nature of prospection

There are still many basic questions about prospection left to be fully worked out. For example, how do different forms of thinking about the future—episodic prospection, delay discounting, mind-wandering, etc.—relate to each other? Do they share similar neural mechanisms?

Additionally, more work needs to be done to determine the extent to which people tend to think about the future in their day-to-day lives, either purposefully or when their minds are wandering, and how this varies from individual to individual. As described earlier, some researchers are active-

ly working on these questions. For example, the classification tool that uses a person's social media posts to determine their temporal orientation could be used to determine whether one's temporal orientation is a relatively stable trait across the lifespan—and, building on that insight, it could inspire interventions to encourage people to be more future-oriented (to think about retirement, for example) (Nie et al., 2015)[1].

Related to these questions about day-to-day prospection is another interesting area that warrants further exploration: factors that influence individual differences in prospection. For example, studies have found that people in Western countries tend to use more detail when simulating future events than do people from East Asian countries and that women tend to use more detail than men (Q. Wang et al., 2011)[52](Q. Wang et al., 2014)[32]. What causes these differences, and do they have ramifications in day-to-day life? And how might other demographic differences affect not only prospection itself but also the effectiveness of prospection-based interventions?

Prospectio across the lifespan

Another area ripe for future work is how thinking about the future changes across development and throughout the lifespan. Only a few studies have examined prospection in middle childhood, adolescence, and later adulthood. Some remaining questions include: Are there interventions that can help children develop prospection abilities? Would such interventions be adaptive? Does the environment in which children grow up affect their ability and tendency to think about the future (Ghetti & Coughlin, 2018)[1]?

And how does aging influence how people think about the future?

Downsides to prospectio ?

Also warranting further examination are the potential downsides of prospection. As Roepke and Seligman write in a recent review, “Intense future-directedness might lead people to miss out on savouring the present moment, benefiting from reminiscence, or enjoying flow” (Roepke & Seligman, 2016)[37]. As discussed above, other work has found that fantasizing about the future can actually make people less likely to reach their goals, if they don’t consider potential obstacles in these fantasies (Oettingen & Reininger, 2016)[8].

Depressio a d prospectio

Many open questions remain as to the connection between future-thinking and depression,

as Seligman and Roepke lay out in their review (Roepke & Seligman, 2016)[37]. For starters, their hypothesis that deficits in prospection can cause depression requires empirical investigation. Additionally, studies will need to compare the effectiveness of present-focused interventions—such as mindfulness—with those that focus on the future. One interesting possibility is that some present-focused therapies may actually work via indirectly changing faulty future-thinking. For example, focusing on the present by being mindful may stop people from negatively ruminating about their future.

Improving prospectio

Much work remains to be done in order to better understand how prospection can be improved. In particular, many of the specific cognitive therapies designed to target how people think about the future—such as future-directed therapy and hope therapy—require further validation via larger randomized control trials. The newly developed prospective writing intervention is an especially attractive avenue for future study because it is low-cost and can be self-administered (Roepke et al., 2017)[10].

With a growing body of interdisciplinary researchers interested in how people think about the future, many of these questions will likely be addressed in the coming years—suggesting a rich and fruitful future for the science of prospection.

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