UC Irvine

UC Irvine Electronic Theses and Dissertations

Title

How Affective Forecasts Reflect Social Goals, Inform Decisions, and Motivate Goal-Directed Action

Permalink

https://escholarship.org/uc/item/28j9g9zx

Author

Carlson, Steven

Publication Date

2021

Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial License, availalbe at https://creativecommons.org/licenses/by-nc/4.0/

Peer reviewed|Thesis/dissertation

eScholarship.org Powered by the California Digital Library
University of California

UNIVERSITY OF CALIFORNIA, IRVINE

How Affective Forecasts Reflect Social Goals, Inform Decisions, and Motivate Goal-Directed Action

DISSERTATION

submitted in partial satisfaction of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in Psychological Science

by

Steven J. Carlson

Defense Committee:

Professor Linda Levine, Chair

Professor Peter Ditto

Professor Elizabeth Loftus

2021

© 2021 Steven James Carlson

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

I would like to thank all the people in my life who have supported me during my graduate studies and helped me to grow as a researcher. First, I would like to thank my advisor and dissertation committee chair, Dr. Linda Levine. Linda has consistently encouraged me to investigate research questions that I am passionate about and has helped me to identify and appreciate both the contributions and limitations of academic work. She taught me how to think critically about scientific ideas and to clearly express my own. At lab meetings and individual meetings, Linda's thoughtful comments, insightful suggestions, and encouragement helped me to improve the quality of my own work and modeled how to provide effective feedback to improve the work of others. When personal challenges arose outside of my academic endeavors, Linda never hesitated to offer her advice and compassionate support. I am deeply grateful that I was fortunate enough to have such a wonderful advisor.

I would like to thank my dissertation committee members, Dr. Peter Ditto, Dr. Elizabeth Loftus, Dr. Elizabeth Martin, and Dr. Connie Pechmann. They have supported me during my graduate studies and have taken the time to learn about my academic interests. I have benefited from the mentorship and support of many others, Dr. Susan Charles, Dr. JoAnn Prause, Dr. Karen Rook, Dr. Azim Sharif, and Dr. Roxanne Silver.

I would like to thank members of the Cognition and Emotion Laboratory for their support and encouragement over the years. Thank you to Brendon Butler, Kevin Cochran, Alison Goldstein, Kaitlin Hardin, Arpi Hovasapian, Emma Grisham, Melissa Karnaze, Hyunjin Koo, Melody Moore, Hugo Sanchez Hernandez and Emily Urban. I would also like to thank Christine Fung and Joanna Hong for your support.

I would like to thank my parents, Richard and Wanda Carlson, for all of their continued support. Dad, you taught me the value of critical thinking and pushed me to excel at everything I did, and my mom, you offered me your unconditional support though all the journeys of my life. I would also like to thank my brother, Michael Carlson and my friend Bill Harding, who were there when I needed them and provided me with valuable advice along the way. Thank you.

Financial support was provided by National Science Foundation Award #1451214 to Linda J. Levine and Award #1451297 to Heather C. Lench.

STEVEN J. CARLSON

Curriculum Vitae

EDUCATION

Ph.D., Department of Psychological Science 2021
Cognition and Emotion Laboratory, PI Linda J. Levine, PhD
University of California, Irvine
Areas of interest: social cognition, affective forecasting, memory, emotion, well-being

Research Assistant, Department of Psychology 2014
Emotion, Decision, Judgment, Intuition Lab, PI, Leaf Van Boven, PhD
Institute for Behavioral Genetics Lab, PI, Matthew C. Keller, PhD
University of Colorado, Boulder

Specialization in Chinese Mandarin 2005
U.S. Navy, Defense Language Institute, Monterey, California

M.A., Political Management 2000
George Washington School of Political Management, District of Columbia

B.A., Political Science 1997
University of Arizona

ACADEMIC AND PROFESSIONAL POSITIONS

Research Analyst, Orange County Social Services Agency 2021-present

Graduate Student Researcher, Cognition and Emotion Lab, UC Irvine 2015-2021

Teaching Associate, Psychology Fundamentals, UC Irvine 2020

Research Assistant, Emotion Decision, Judgment, Intuition Lab, CU Boulder 2014-2015

Research Assistant, Institute for Behavioral Genetics, CU Boulder 2013

Language Analyst, National Security Agency 2010-2012

Logistic Air Mission Manager, National Security Agency/CSS Hawaii 2007-2011

PUBLISHED MANUSCRIPTS

Carlson, S. J., Levine, L. J., Lench, H. C., Flynn, E., Carpenter, Z. K., Perez, K. A., & Bench, S. W. (in press). You shall go forth with joy: Religion and aspirational judgments about emotion. *Psychology of Religion and Spirituality.*

Lench, H. C., Levine, L. J., Dang, V., Kaiser, K. A., Carpenter, Z., Carlson, S. J., Flynn, E., Perez, K. A., & Winckler, B. (2021). Optimistic expectations have benefits for effort and emotion with little cost. *Emotion*. Advance online publication.

Levine, L. J., Lench, H. C., Stark, C. E., Carlson, S. J., Carpenter, Z., Perez, K. A., Stark, S., & Frithsen, A. (2020). Predicted and remembered emotion: Tomorrow's vividness trumps yesterday's accuracy. *Memory*, *28*(1), 128-140.

Lench, H. C., Levine, L. J., Perez, K., Carpenter, Z. K., Carlson, S. J., Bench, S. W., & Wan, Y. (2019). When and why people misestimate future feelings: Identifying strengths and weaknesses in affective forecasting. *Journal of Personality and Social Psychology, 116*(5), 724-742.

Lench, H. C., Levine, L. J., Perez, K., Haggenmiller, Z. K., Carlson, S. J., & Tibbett, T. (2019). Changes in subjective well-being following the U.S. Presidential Election of 2016. *Emotion, 19*(1), 1-9.

Levine, L. J., Lench, H. C., Karnaze, M., & Carlson, S. (2018). Bias in predicted and remembered emotion. *Current Opinion in Behavioral Sciences, 19,* 73-77.

PRESENTATIONS

Carlson, S. J, Levine, L. J., Lench, H. C., Flynn E., Winckler, B. E., Fortier, M., Kain, Z. N. (2020, April) Using emotion to guide decisions: Medical students forecast their feelings about career choices. Paper selected for presentation at the Society for Affective Science Conference, San Francisco, CA, United States. (Conference canceled)

Carlson, S. J. (2019, February) Judgment and Decision Making. Guest lecture for Psychology Fundamentals course.

Carlson, S. J. (2019, January) Long-term Memory. Guest lecture for Psychology Fundamentals course.

Carpenter, Z. K., Lench, H. C., Levine, L. J., Perez, K. A., Carlson, S. J., & Bench, S. W. (2018, April). When and why people misestimate future feelings. Paper presented at the Society for Affective Science conference, Los Angeles, CA.

Levine, L. J., Lench, H. C., Stark, C. E. L., Carlson, S. J., Carpenter, Z. K., & Perez, K. A. (2018, April). Prospection and retrospection about emotion: Tomorrow's vividness trumps yesterday's accuracy. Paper presented at the Emotion and Decision Making Preconference to the Society for Affective Science conference, Los Angeles, CA.

Perez, K. A., Lench, H. C., Levine, L. J., Carpenter, Z. K., Carlson, S. J., & Tibbett, T. (2018, March). Impact of the 2016 U.S. presidential election on subjective well-being. Poster presented at the Society for Personality and Social Psychology conference. Atlanta, GA.

Carlson, S. J., Levine, L.J., Lench, H.C. (2017, May). Religious people forecast, but do not experience, less unhappiness following negative events. Poster presented at the 29th Association for Psychological Science convention, Boston, MA.

Carlson, S. J., Levine, L.J., Lench, H.C. (2017, April). Religious people forecast, but do not experience, less unhappiness following negative events. Paper presented at the Society for Affective Science conference, Boston, MA.

Carlson, S. J., Levine, L.J., Lench, H.C. (2017, March). Religious people forecast, but do not experience, less unhappiness following negative events. Paper presented at The University of California Well-Being Conference, University of California, Riverside.

GRANTS AND AWARDS

Dean's Dissertation Data Collection Fellowship	2020
Dean's Dissertation Writing Fellowship	2020
Graduate Student Mentoring Award	2019-2020
Alison Clarke-Stewart Excellence in Research Award	2017
Graduate Student Research, Linda Levine NSF Grant	2016-2017
Graduate Student Mentoring Award	2016-2017
Dean's Recruitment Fellowship - University of California, Irvine	2015

PROFESSIONAL SERVICE

Graduate Admissions Coordinator	2019-2020
Peer Mentor	2019-2020
Cohort Liaison Initiative Committee	2018-2019
Graduate Student Awards Committee member	2017
Undergraduate Research Assistant Mentor	2016-2017
Poster Reviewer for Society for Personality and Social Psychology	2016

ABSTRACT OF THE DISSERTATION

How Affective Forecasts Reflect Social Goals, Inform Decisions,

and Motivate Goal-Directed Action

by

Steven James Carlson

Doctor of Philosophy in Psychological Science

University of California, Irvine, 2021

Professor Linda Levine, Chair

Forecast and remembered emotion play an important role in people's decisions and may influence their personal happiness and well-being. Chapter 1 provides an overview of this three-part dissertation. Across five studies, we investigated how affective forecasts are influenced by social aspirations, shape people's decisions, and motivate goal-directed action. In Chapter 2, we demonstrate that religion, an aspirational source of social identity, predicts people's beliefs about how they should feel in the wake of a negative life event. In two studies, more religious participants reported greater satisfaction with life and forecast that they would feel less unhappiness about a negative outcome – a poor exam grade. Yet religiosity was not associated with experiencing less unhappiness following a negative outcome, even when participants' religious identity was primed. The association between religiosity and life satisfaction was fully mediated by self-enhancement. These findings suggest that reports of life satisfaction and effective coping among religious people stem partly from their expectations about how they should feel, rather than from how they actually do feel, following negative events.

In Chapter 3, we compared forecasts of emotional intensity, frequency, and duration. We assessed which of these features of their future emotional experience people forecast in order to make important life decisions. We also evaluated whether the features of forecast emotion that people relied on more when making decisions were the ones they forecast more accurately. In Study 1, undergraduates reported relying more on forecast emotional intensity than frequency or duration to decide which colleges to apply to. In Study 2, a three-part longitudinal study, fourth year medical students reported relying more on forecast emotional intensity than frequency or duration to decide how to rank residency programs in preparation for being matched with a program. Medical students were also most accurate when forecasting the intensity of their emotional response to matching with their program. Further, more accurate forecasts of emotional intensity were associated with positive outcomes, including being matched with a more favored residency program and being more satisfied with that program. Greater reliance on, and more accurate prediction of, emotional intensity when making life-changing decisions provides important new evidence that people are better forecasters than previously thought.

People try to anticipate how future outcomes will make them feel in order to make decisions best aligned with their goals. Given that people's affective forecasts can be mistaken, in Chapter 4 we conducted an experiment to find out what makes them so motivating. Participants reported their forecast, experienced, and remembered emotional response to being denied an opportunity to earn money. We manipulated the importance of this outcome by offering participants a chance to earn either $5 or $100. To assess motivation, we measured how long participants spent time answering survey questions in order to qualify to earn the money. Participants remembered their emotional response to being denied the opportunity to earn money more accurately than they forecast it. Yet, they perceived their forecasts to be more accurate and

vivid than their memories. Across conditions, the more important participants perceived the outcome to be, the less accurately they forecast their emotional response, but the more accurate and vivid they perceived their forecasts to be. The vividness of forecasts, not their intensity, actual accuracy, or perceived accuracy, predicted participants' greater allocation of effort to attain an important outcome than an unimportant outcome. These results highlight the special role that the vividness of forecast emotion plays in motivating behavior to attain important goals.

In summary, these studies reveal how social identity is an underexplored source of bias for affective forecasts, that people are relatively poor at forecasting their feelings about an important outcome, and how emotion forecasts are related to behavior.

CHAPTER 1:

INTRODUCTION

People draw on memories of how they felt in the past, and forecasts of how they will feel in the future, to make decisions that will maximize their well-being (Shepperd, Findley-Klein, Kwavnick, Walker, & Perez, 2000). Though people have a lot of practice forecasting emotion, past research shows that they often overestimate the emotional impact of future events (Ayton, Pott, & Elwakili, 2007; Wilson & Gilbert, 2003), an error known as the impact bias (Gilbert, Driver-Linn, & Wilson, 2002). More recent research shows that the impact bias is not as pervasive as previously thought. People are fairly accurate when they forecast the intensity of emotion future events will evoke, but often overestimate the frequency and duration of their emotional response (Doré, Meksin, Mather, Hirst, & Ochsner, 2016; Lench et al., 2019).

This three-part dissertation addresses several previously unanswered questions concerning forecast and remembered emotion. First, research shows that religion is associated with reports of greater well-being and happiness (Green & Elliott, 2010). Religious people may indeed be happier and more satisfied with their lives, or these reports may be due in part to aspirational beliefs about how they will or should feel as members of a religious group. An unanswered question is how a group's ideals shape their affective forecasts. We investigated how an aspirational source of identity, religion, was related to the emotions people forecast and experienced (Chapter 2). Second, people are better at forecasting some features of their emotional experience than others (Lench et al., 2019). However, no prior research has examined which features they bring to mind in order to make decisions. Therefore, we investigated what features of emotion people forecast to help them make important life decisions. We also investigated whether people rely more on forecasts (e.g., intensity) that tend to be more accurate

(Chapter 3). Third, in order to make good choices people engage in mental time travel, shuttling between mental representations of the past and future emotional experiences. The more intense emotion they expect an event to evoke, the more resources they allocate toward achieving or avoiding that outcome (Miloyan & Suddendorf, 2015). But emotion forecasts can be inaccurate, leading to squandered effort. This led us to ask how accurately people can forecast and remember emotion, how accurate they perceive their forecasts and memories to be, and how forecasts motivate behavior if they are often inaccurate (Chapter 4). Together, these studies advance our understanding of the relationship between aspirational beliefs and emotion forecasts, which forecasts people rely on to make important decisions, and how the vividness of emotional representations motivates behavior. I summarize each project below.

Religion and Aspirational Judgments about Emotion

Chapter 2 presents two studies that examined the relation between religion, an aspirational source of social identity, and affective forecasts (Carlson et al., *in press*). People who are more religious often report greater subjective well-being and more effective coping with negative life events (Green & Elliott, 2010). These judgments may reflect how religious people actually feel in the wake of negative events. However, emotion judgments are not always accurate. They may be subject to wishful thinking or self-enhancement, as people try to maintain positive self-regard and buffer themselves against negative information (Paulhus, 1994). Emotion judgments are particularly susceptible to bias when they are temporally distant or abstract, rather than immediate and concrete (Levine, 1997; Robinson & Clore, 2002). A recent meta-analysis showed that religiosity is associated with self-enhancement and that this relationship is found in numerous countries and cultures (Sedikides & Gebauer, 2010). Thus, we proposed that, as a powerful source of aspiration, religious beliefs may shape how people want

or expect to feel, leading them to augment forecast positive feelings and minimize negative ones.

In two studies, undergraduates reported their satisfaction with life and forecast how unhappy they would feel if they received a lower exam grade than expected. Later, those who received a lower grade than expected reported how unhappy they actually felt. In Study 2, we primed religious belief immediately before one group reported experienced happiness and assessed self-enhancement. We assessed whether greater religiosity was associated with more positive self-reports for emotion judgments that were abstract and temporally distant. We also assessed whether the actual emotional experience of religious individuals differed from that of less religious individuals in the wake of a specific and temporally-proximate event. This research represents the first instance in which forecast and experienced emotion, as well as abstract judgments of life satisfaction, were assessed to better understand when religion is linked to greater well-being and improved coping.

The Features of Emotion People Forecast to Make Important Decisions

Chapter 3 examines the features of their future emotional experience that people bring to mind when they want to make good decisions. Despite the importance of affective forecasts for decision making, early findings show that people are poor at forecasting the emotional impact of future events (Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000), commonly overestimating the strength of their emotional response (Ayton et al., 2007; Wilson & Gilbert, 2003). More recent evidence indicates that accuracy differs depending on the feature of emotion people are trying to predict. Forecasts of emotional intensity are significantly more accurate than forecasts of feelings in general, frequency, or mood (Levine, Lench, Kaplan, & Safer, 2012, 2013; Lench et al., 2019). However, people's greater accuracy in forecasting emotion intensity matters only if they actually rely on anticipated emotional intensity to make decisions. People may instead base

important decisions with lasting consequences on forecasts that tend to be less accurate such as the duration or the frequency of their future emotional experience.

To address this issue, we conducted two studies on the features of emotion people rely on to make important decisions. In Study 1, undergraduates reported how much they relied on forecasts of emotional intensity, frequency, and duration when deciding which universities to apply to. In Study 2, we assessed how much fourth year medical students reported relied on different features of emotion when they were deciding how to rank residency programs in preparation for being matched with a program. We also examined how accurately they forecast each of these features of emotion. This study addresses important gaps in the affective forecasting literature. It is the first examination of which forecasts people rely on to make important life decisions: how intensely they expect to feel about an event, how frequently they will experience emotion, or the expected duration of their reactions to the event. It uses an important event with significant long-term consequences, rather than outcomes that involve limited individual decision making. The study also explores whether inaccurate forecasts are associated with better or worse outcomes. Addressing these questions is essential, not only for a theoretical understanding of how people think about their futures, but also for understanding how to intervene to improve decisions.

How Affective Forecasts Motivate Goal-Directed Action

Chapter 4 examines how the importance of outcomes for people's goals affects the actual accuracy, perceived accuracy, and vividness of forecast and remembered emotion, and how forecast emotion motivates goal-directed action. Since remembered emotional experiences already occurred, and people can retrieve episodic details about them in a fairly direct manner, memories of emotion should be more accurate than forecasts. If people are well-calibrated they

ought to perceive their memories to be more accurate than their forecasts. However, several lines of research suggest an alternate perspective. People often rate future events as more important than past events (Van Boven & Caruso, 2015), and mental representations of important experiences tend to be vivid and emotionally evocative (Cole & Berntsen, 2016; Lehner & D'Argembeau, 2016; Rubin, 2014; Van Boven & Ashworth, 2007). In turn, mental representations that are vivid are perceived to be more accurate (Benjamin, Bjork, & Schwartz, 1998; Kelley & Jacoby, 1990). Thus, we hypothesized that the vividness of affective forecasts, particularly about important outcomes, would render people poor at judging their accuracy, even leading them to perceive their emotion forecasts to be more accurate than their memories. We tested this hypothesis by varying the importance of a negative outcome and assessing the accuracy, perceived accuracy, and vividness of participants' forecast and remembered emotional responses. Matching the time intervals between participant reports of forecast and experienced emotion, and their reports of remembered and experienced emotion, enabled us to directly compare the actual and perceived accuracy of representations of past and future emotion.

Chapter 4 also investigated the characteristics of affective forecasts that motivate goal-directed action. Even though they are sometimes inaccurate, affective forecasts are thought to be functional because they motivate goal-directed action (DeWall, Baumeister, Chester, & Bushman, 2016; Mellers, Schwartz, Ho, & Ritov, 1997). What remains unclear is the motivational contributions of two aspects of affective forecasts: the intensity of emotion people expect to feel in the future (which is a cognitive judgment about future emotion), and the present experience of bringing that future affective state to mind (vividness). We propose that the importance of future events makes them highly vivid, and that vividness in turn motivates behavior. Thus, this experiment fills an important gap in the literature by investigating how event

importance affects the vividness and accuracy of forecast and remembered emotion and how forecasts motivate goal-directed behavior.

Chapter 5 reviews the conclusions drawn from the five studies presented in this dissertation. Together, these investigations provide important insights about a range of topics related to affective forecasting. This work examined an understudied source of biased affective forecasts: social identity. An experiment showed that people are poor at judging the accuracy of forecasts about important outcomes. It also, on multiple fronts, assessed how affective forecasts are related to decisions. We investigated which features of their emotional experience people bring to mind when making important decisions and how forecasts motivate decision making and goal-directed action.

CHAPTER 2:

YOU SHALL GO FORTH WITH JOY:

RELIGION AND ASPIRATIONAL JUDGMENTS ABOUT EMOTION

Citation: Carlson, S. J., Levine, L. J., Lench, H. C., Flynn, E., Carpenter, Z., Perez, K., & Bench, S. (in press). You shall go forth with joy: Religion and aspirational judgments about emotion. *Psychology of Religion and Spirituality*.

Abstract

People who are religious report more effective coping with negative events and greater satisfaction with life. These emotion judgments may reflect how religious people actually feel in the wake of negative events, or they may be aspirational and self-enhancing, reflecting how religious people hope or expect to feel as a member of their faith. To test this, in two studies, undergraduates reported their forecast and experienced emotional response to receiving an exam grade that was lower than expected. They also reported their satisfaction with life. In Study 2, we varied whether religious identity was primed before participants reported their emotional experience, and we assessed self-enhancement. More religious participants forecast that they would feel happier about receiving a lower exam grade than expected, but did not actually experience greater happiness, even when their religious identity was primed. More religious participants also reported greater satisfaction with life, and this association was fully mediated by self-enhancement. These findings suggest that reports of effective coping and life satisfaction among religious people stem partly from aspirational expectations about how they will or should feel, rather than from how they actually do feel, following negative events.

You Shall Go Forth with Joy:

Religion and Aspirational Judgments about Emotion

People who are more religious report coping better with adversity and greater satisfaction with life (e.g., Ferriss, 2002; Green & Elliott, 2010; Salsman, Brown, Brechting, & Carlson, 2005). These associations may reflect how religious people actually feel in the wake of negative events and in their daily lives. But judgments about emotion are susceptible to bias, particularly when they concern experiences that are temporally distant or abstract rather than immediate and concrete (Dunning, Meyerowitz, & Holzberg, 1989; Robinson & Clore, 2002). Thus, the positive emotion judgments of religious people may be aspirational and self-enhancing – reflecting how they hope or expect to feel as a member of their faith. To test this, we assessed the relation of religiosity to three types of emotion judgments. We assessed: (a) forecast emotion concerning a future negative event, a judgment that is temporally distant, (b) experienced emotion following a negative event, a judgment that is immediate and concrete, and (c) satisfaction with life, a judgment that is abstract. We further assessed whether priming religious identity influenced people's judgments about their emotional experience, and whether self-enhancement mediated the associations between religiosity and emotion judgments.

Biases in Judgments about Emotion

Emotions are fleeting, multisystem responses to events that people view as obstructing or promoting their goals (Van Cappellen, Toth-Gauthier, Saroglou, & Fredrickson, 2016). People frequently make judgments about their emotional experiences such as forecasting how they will feel about future events and judging how satisfied they feel with their lives. These judgments are important for motivating people to pursue satisfying outcomes and avoid distressing ones, but are not necessarily accurate (Mellers & McGraw, 2001; Miloyan & Suddendorf, 2015). For example,

people often overestimate when forecasting the emotional impact of future events, an error known as the impact bias (Gilbert et al., 2002). This bias results from people expecting to think about future events more than they actually will, and from failing to anticipate how quickly they will adapt (Wilson & Gilbert, 2003). Recent research shows that the magnitude of the impact bias depends on the feature of emotion people are forecasting. People overestimate the frequency and duration of future emotion but are more accurate when judging its peak intensity (Doré et al., 2016; Lench et al., 2019; Levine et al., 2012; Levine, Lench, Karnaze, & Carlson, 2018).

Emotion judgments are also susceptible to wishful thinking and self-enhancement. Holding unrealistically positive views of themselves and their future serves to buffer people against negative information and maintain self-regard (Paulhus, 1994). In one study, people were asked to forecast how they, or another person, would feel if they won or lost money in a gambling task. People forecast more positive and less negative emotions for themselves than for others, particularly in response to negative outcomes (Ong, Goodman, & Zaki, 2018). People also forecast that their emotional reactions to positive events will last longer than their reactions to negative events, a difference observed only in forecasts about themselves, not others (Mata, Simão, Farias, & Steimer, 2019). These studies did not assess participants' actual emotional experience but suggest that forecasts concerning the self can be unduly optimistic. Judgments of satisfaction with life are also subject to self-enhancement (Alicke, 1985). Reports of greater satisfaction are predicted by individual differences in self-enhancement and by experimental manipulations of participants' motivation to self-enhance (Wojcik, Hovasapian, Graham, Motyl, & Ditto, 2015).

Judgments are most susceptible to bias when they concern experiences that are temporally distant or abstract (Levine, 1997; Robinson & Clore, 2002). When people forecast

how they will feel about future events, access to episodic experience is limited. As a result, they rely partly on their beliefs and wishes concerning how they will feel (e.g., Ong et al., 2018; Robinson & Clore, 2002). When making abstract judgments about their satisfaction with life, people have broad flexibility in choosing which of their experiences have diagnostic value and how different experiences should be weighed, providing ample opportunity for self-enhancement (Dunning et al., 1989). In contrast, judgments about temporally-proximal and concrete experiences, such as a specific negative event that just occurred, are less subject to bias (Robinson & Clore, 2002).

People's susceptibility to making aspirational, self-enhancing judgments also varies across individuals, and a meta-analysis demonstrated a reliable association between religiosity and self-enhancement that spanned religious traditions and countries (Sedikides & Gebauer, 2010). People who identified as religious were most likely to make self-enhancing judgments about characteristics they valued. For instance, Christians in the United States self-enhance more on adherence to biblical commandments than on academic knowledge unrelated to Christian beliefs (Gebauer, Sedikides & Schrade, 2017). These findings raise questions about the extent to which religious people's positive judgments about emotion reflect their aspirations and expectations or their actual emotional experience.

Religion and Judgments about Emotion

Religiosity has been found to be associated with well-being among young, middle-aged, and older adults (Stock, Okun, & Benin, 1986; Witter, Stock, Okun, & Haring, 1985), across four major world religions (Buddhist, Christian, Hindu, and Islam), and using a variety of measures of religion (Diener, Tay, & Myers, 2011; Leondari & Gialamas, 2009; VanderWeele, 2017). Researchers have identified several important pathways through which religion

contributes to well-being and emotional resilience when facing adversity. Religious belief systems offer people the opportunity to reframe negative events positively (Parappully, Rosenbaum, Van Den Daele, & Nzewi, 2002; Vishkin, Ben-Nun Bloom, Schwartz, Solak, & Tamir, 2019). Religious and spiritual practices elicit positive emotions, such as awe, gratitude, and love, which contribute to practitioners' sense of well-being (Van Cappellen et al., 2016). Religious communities also provide social support (Pollner, 1989; Salsman et al., 2005), and encourage people to adopt healthy lifestyles (Powell, Shahabi, & Thoresen, 2003).

The current research examined an additional pathway from religiosity to positive judgments about emotion. As a powerful and aspirational source of social identity, religion shapes people's beliefs about how they should behave (Ysseldyk, Matheson, & Anisman, 2010). Religion also shapes people's beliefs about how they should feel (Tsai, Miao, & Seppala, 2007). For example, in cross-cultural studies, religiosity has been shown to be associated with desiring to feel awe and gratitude (Vishkin, Schwartz, Ben-Nun Bloom, Solak, & Tamir, 2020). Thus, when religious people anticipate equanimity in the face of future negative events, and report feeling satisfied with their lives, their beliefs about how they expect or would like to feel as a member of their group may lead them to augment positive feelings and minimize negative ones.

Revered texts of several major world religions encourage adherents to respond to adverse events with perseverance, patience, and positive emotion. The Christian Bible counsels, 'Consider it pure joy, my brothers and sisters, whenever you face trials of many kinds, because you know that the testing of your faith produces perseverance' (James 1:2-3, also see Romans 5:3-5 and Corinthians 12:7-10, *The Holy Bible, New International Version*, 1973/2011). Similarly, the Qur'an encourages patience when faced with adversity: 'And certainly, We shall test you with something of fear, hunger, loss of wealth, lives and fruits, but give glad tidings to

the patient ones' (Holy Qur'an 2:155, Wordsworth Edition, 2001). Given people's tendency to self-enhance concerning characteristics they value (Gebauer et al., 2017), those who are religious may make aspirational and self-enhancing judgments when forecasting their emotional response to adversity and reporting their satisfaction with life.

Religion may also influence the emotions people actually experience day-to-day. In past research, however, differences between religious and cultural groups in the emotions they experience tend to be smaller, and are observed less regularly, than differences in the emotions they view as desirable (Tsai et al., 2007). Kim-Prieto and Diener (2009) experimentally manipulated the salience of religion to find out if this would lead participants to report experiencing valued emotions more frequently. Christian participants who were primed with their religious identity reported having experienced love more frequently than participants for whom religion had not been primed. Participants' reports of the frequency of emotions experienced in the past day or week encompass a range of events which may vary across participants and are subject to retrospective biases (Robinson & Clore, 2002). However, Kim-Prieto and Diener's findings suggest that making people's religious identity salient may promote a more positive emotional experience even in response to an immediate, specific negative event.

The Current Investigation

The current investigation assessed when and why religiosity is associated with positive judgments about emotion. In two studies, we assessed how religiosity was related to forecast and experienced emotion about a negative event, and satisfaction with life. Beliefs about coping with adversity should have little utility for forecasting emotional responses to positive events, so this investigation focused primarily on responses to a negative event: receiving an exam grade that was lower than expected. Many studies of religion, emotion, and coping assess responses to

events that vary markedly across participants. Examining student's judgments in the context of a midterm exam allowed us to hold the emotion-eliciting event constant across participants. To our knowledge, this is the first study to examine how religiosity is related to both forecast and experienced emotional responses to a specific negative event.

In Study 1, undergraduates completed online surveys about two weeks before an exam, and two days after they received their exam grade. Before the exam, they forecast how they would feel if they received a lower grade than expected, a higher grade than expected, and the grade they expected. They also rated their satisfaction with life. Two days after receiving their grade, students indicated whether their grade was lower, higher, or expected, and rated how they were actually feeling about their grade. Study 2 used the same basic method but extended Study 1 in two ways. First, we assessed whether priming participant's religious identity influenced their emotional experience following a negative outcome. Second, we assessed whether self-enhancement mediated the expected associations between religiosity and emotion judgments.

Judgements about experiences that are temporally distant or abstract are more susceptible to the biasing effects of beliefs and desires than judgments about experiences that are temporally proximal and concrete (Dunning et al., 1989; Levine, 1997; Robinson & Clore, 2002). For example, people who are politically conservative report greater well-being than do those who are liberal but do not behave in ways that show they are actually happier (Newman, Schwarz, Graham, & Stone, 2018; Wojcik et al., 2015). Thus, we hypothesized that more religious participants would forecast feeling happier about getting a lower exam grade than expected (temporally distant), and report greater satisfaction with life (abstract). We did not expect more religious participants to report actually experiencing more happiness about receiving a lower grade (temporally proximal and concrete), unless their religious identity was made salient by

priming (Kim-Prieto & Diener, 2009). We further hypothesized that self-enhancement would mediate the expected associations between religiosity and judgments about emotion.

Study 1

This investigation was part of a larger project on emotion and decision-making. Hypotheses for the larger project, concerning the relative accuracy with which people forecast different features of emotional experience, are addressed in another paper (Lench et al., 2019). Only the procedures and materials relevant to the current paper's target research question are reported here. Analyses reported in this paper were not preregistered. Data and software code are available online (https://doi.org/10.17605/osf.io/h9mur).

Method

Participants

We recruited undergraduate students from large, public research universities in California and Texas with a range of religious beliefs by inviting participation from all students in introductory psychology courses in the fall term in which the instructor consented. Participants (N = 707) completed two online surveys for partial course credit. As the survey was lengthy, we analyzed data from participants who correctly answered the two attention-check questions (N = 407). The final sample consisted of women (79%) and men (21%) whose mean age was 19.70 years (SD = 3.08, range = 17 to 53 years).[1] Participants reported their current religion as Catholic (34%), Protestant (8%), general Christian (37%), or atheist/none (10%), with remaining participants reporting another religion (11%). Participants reported their ethnicity as White (33%), Asian (26%), or Hispanic/Latino (26%), or reported other ethnic backgrounds (15%).

Procedure and Materials

Time 1 survey: Forecast emotion. Two weeks before their first psychology midterm

exam of the academic term, participants were emailed a link to an online survey which they completed within five days.

Forecast emotion. Participants reported the grade they expected to receive on their upcoming exam on a 13-point scale that ranged from F (1) to A+ (13). They then forecast how they would feel for three grade outcomes: receiving a lower grade than expected, receiving the grade they expected, and receiving a higher grade than expected. For example, "Suppose you get a grade that is lower than you expect. Two days after you find out your grade, how will you feel about getting that grade?" Participants forecast both how intensely happy, and how intensely unhappy, they would feel, using a scale from 1 *(not at all)* to 9 *(extremely)*.

Time 2 survey: Experienced emotion. Two days after students learned their grade, they were emailed a link to a second survey which they completed by midnight that evening.

Received and expected grade. Participants reported the exam grade they received, on a scale from F (1) to A+ (13). They indicated whether that grade was lower than expected, higher than expected, or expected. Participants again reported the exam grade they had expected to receive, from F (1) to A+ (13).

Experienced emotion. To assess experienced emotion, participants were asked, "How do you feel about receiving that grade?" Participants indicated both how intensely happy, and how intensely unhappy, they felt using a scale from 1 *(not at all)* to 9 *(extremely).*

Importance of grade. Participants rated the importance of their grade both relative to their other goals, and for their long-term goals, from 1 *(not at all)* to 9 *(extremely).*

Religiosity. To capture aspects of religion that may be associated with aspirational beliefs about emotion – personal importance and exposure to religious communities and texts – we computed a three-item index of religiosity (for a similar index, see Leondari & Gialamas, 2009).[2]

We included a general measure common to many studies of religion: "How important is your religion to you?" using a scale from 1 *(not at all)* to 9 *(extremely).* We also assessed religious attendance: "Other than occasional weddings, baptisms, or funerals, thinking back over the past 6 months, how many times do you attend religious services during an average month?", and engagement in religious practices: "Thinking back over the past 6 months, how many times do you engage in religious practices (such as reading religious texts or praying) during an average month?" The latter two items used a scale from 1 *(not at all)* to 7 *(several times a day)*, with a midpoint of 4 *(about once a week)*. Because the question scales differed, *z*-scores were calculated for each question, and averaged to obtain a composite religiosity score; $\alpha = .88$.

Satisfaction with life. Participants also completed the five-item Satisfaction with Life Scale (SWLS), the most frequently used measure of subjective well-being (Diener, Emmons, Larsen, & Griffin, 1985). Participants rated each item (e.g., "I am satisfied with my life," "In most ways, my life is close to ideal") from 1 *(strongly disagree)* to 7 *(strongly agree)*; $\alpha = .86$.

Emotion measures. Participants' ratings of happiness and unhappiness were strongly negatively-correlated (all *r*s > -.83). Therefore, consistent with past studies, we created composite measures of forecast emotion, and of experienced emotion, by subtracting each participant's rating of unhappiness from their rating of happiness (e.g., Kahneman & Krueger, 2006). Higher values on these measures indicated more happiness. To assess bias in forecasting emotion, we subtracted experienced emotion from forecast emotion.

Results and Discussion

At Time 2, after receiving their exam grade, participants rated their grade as very important relative to their other goals ($M = 5.65$, $SD = 2.42$) and as very important for their long-term goals ($M = 6.46$, $SD = 2.27$). On average, participants reported at Time 2 that they had

expected a grade of B+, but the average grade received was a B.[3]

Forecast and Experienced Emotion

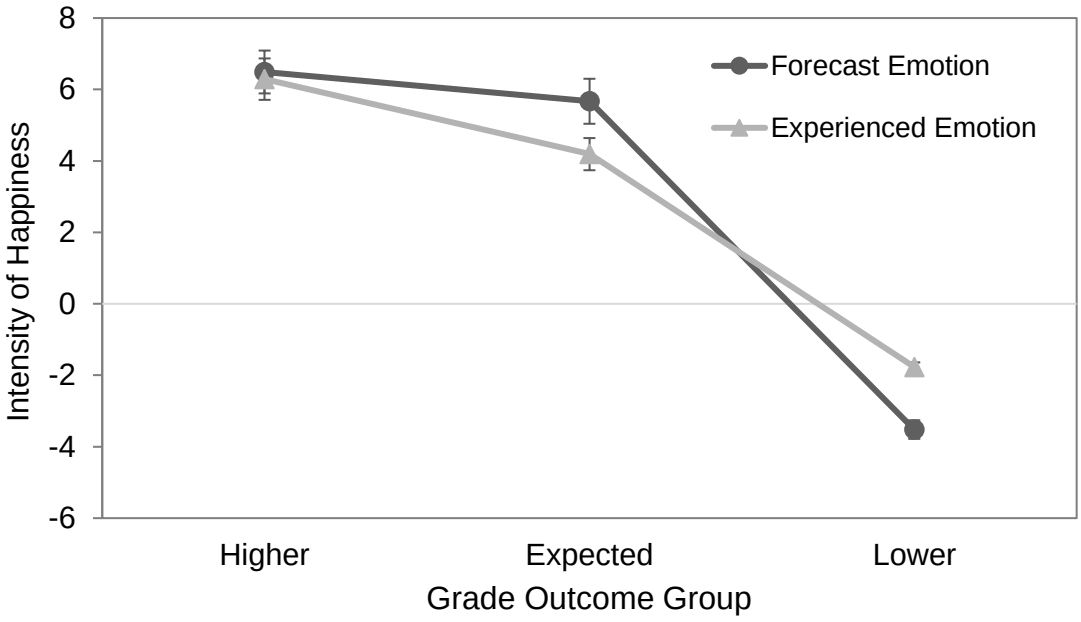
The correlation between forecast and experienced emotional intensity was moderately strong, $r(369) = .71$, $p < .001$. To assess the direction of forecasting bias, we conducted a mixed model ANOVA. The within subjects factor was emotion judgment (forecast happiness, experienced happiness) and the between subjects factor was grade outcome (higher than expected, lower than expected, expected grade). The results showed a main effect of grade outcome, $F(2, 366) = 608.48$, $MSE = 6592.94$, $p < .001$, $\eta^2_p = .77$, and an interaction between emotion judgment and grade outcome, $F(2, 366) = 23.68$, $MSE = 170.44$, $p < .001$, $\eta^2_p = .11$.

Figure 1.1, Panel A, shows the mean intensities of forecast and experienced happiness for participants who received a grade that was higher than expected, lower than expected, or the expected grade. Post hoc tests comparing forecast and experienced emotion in each group showed no significant bias among participants who received a higher grade than expected, $t(115) = 0.88$, $p = .38$, $d = .10$, 95% CI [-0.25, 0.65]. These participants both forecast and experienced intense happiness. In contrast, and consistent with research showing a tendency to overestimate the emotional impact of future events (Wilson & Gilbert, 2003), participants overestimated how happy they would feel about getting the grade they expected, $t(76) = 4.27$, $p < .001$, $d = .56$, 95% CI [0.83, 2.27], and overestimated how unhappy they would feel about getting a lower grade than expected, $t(175) = 5.15$, $p < .001$, $d = 0.50$, 95% CI [1.12, 2.51].

Religion and Judgments about Emotion

Next, we examined the associations between religiosity and judgments about emotion. As hypothesized, across all participants, the more religious participants were, the happier they forecast they would feel about receiving a low exam grade, $r(378) = .15$, $p = .004$. Replicating previous research (e.g., Green & Elliott, 2010), more religious participants also reported greater

A. Study 1



B. Study 2

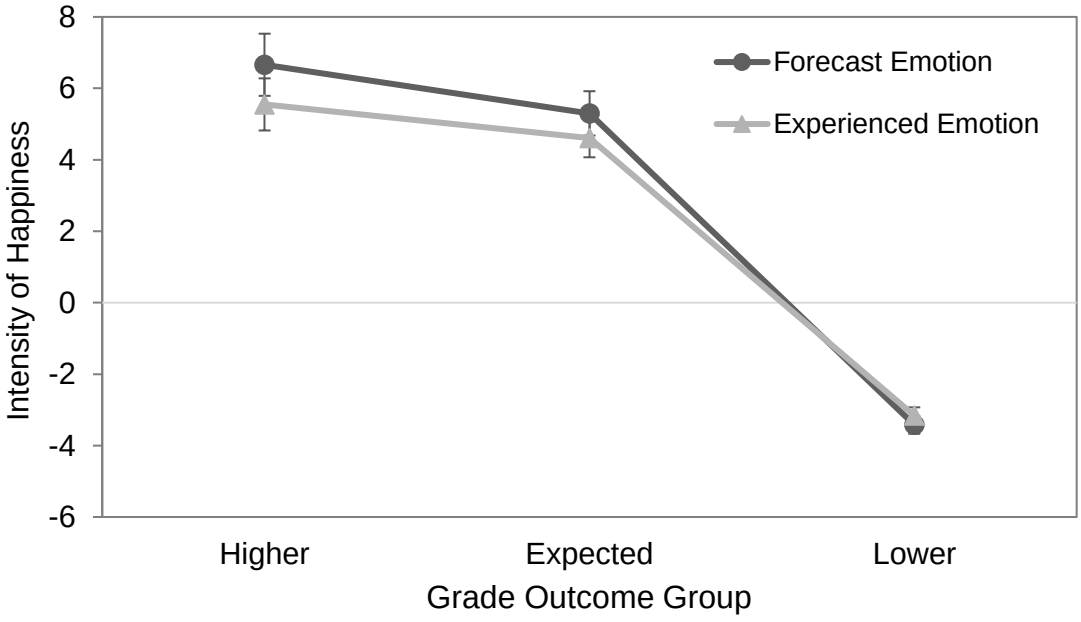


Figure 1.1. Mean forecast and experienced intensity of happiness (happiness minus unhappiness) for each grade outcome group in Study 1 and in Study 2. Error bars represent +/−1 standard error.

satisfaction with life, $r(403) = .24$, $p < .001$. We also examined how participants' religiosity was related to forecast and experienced happiness separately for two groups: students who received a lower grade than expected (48% of participants), and students who received either a higher grade than expected (29%) or the grade they expected (23%). As hypothesized, among students who got a lower exam grade than expected, more religious students forecast that they would feel happier about their grade, $r(178) = .18$, $p = .01$. However, after receiving a lower grade than expected, more religious students did not actually experience more happiness, $r(182) = .04$, $p = .56$. No significant association was found between religiosity and forecasting accuracy (i.e., forecast - experienced emotion), $r(175) = .07$, $p = .33$.

The focus of this research was on when religion buffers emotional responses to negative events, thus analyses focused on participants who received a lower exam grade than they had expected. However, we also examined emotion judgments for participants who received a higher grade or the grade they expected. Because both of these groups forecast and experienced intense happiness (see Figure 1.1, Panel A), we combined them. No significant associations were found between religiosity and forecast happiness, $r(196) = .08$, $p = .27$, experienced happiness, $r(203) = .02$, $p = .82$, or forecasting accuracy, $r(192) = .04$, $p = .58$. The pattern and significance of these results did not change when the higher grade group and expected grade group were analyzed separately.

In summary, the more religious participants were, the happier they forecast they would feel about receiving a lower exam grade than expected. Yet, among students who later received a lower than expected grade, more religious participants did not actually experience greater happiness. Religiosity was not associated with the accuracy of forecasts. We also found that more religious participants reported greater satisfaction with life, a result that is consistent with

past research (e.g., Diener et al., 2011). Thus, religiosity was associated with more positive judgments about emotional experiences that were temporally distant (forecast emotional response to a negative outcome) or abstract (satisfaction with life) but not with more positive judgments about an emotional experience that was immediate and concrete (experienced emotional response to a negative outcome).

Study 2

Study 2 used the same design and procedures as Study 1, with two exceptions. First, we primed religion for one group of participants immediately before they reported their emotional response to their exam grade. In prior research, Christians for whom religion was primed reported more frequent experiences of awe and love in the prior week than did Christians in a control group (Kim-Prieto & Diener, 2009). Thus, making religion salient may lead more religious participants to experience greater happiness following a negative outcome. Second, we assessed self-enhancement. When religious people forecast their emotional responses to future negative events, or make abstract judgments about their overall satisfaction with life, beliefs about how they will or should feel as a member of their religious group may lead them to augment positive feelings and minimize negative ones, a form of self-enhancement. Thus, we tested whether self-enhancement mediated the association between religiosity and forecast emotion, or the association between religiosity and satisfaction with life.

Method

Participants

We recruited undergraduate students from public research universities in California and Texas with a diverse range of religious beliefs by sampling from all introductory psychology courses in which the instructor consented in the fall term. Of the 573 students who completed

both surveys, participants were retained if they successfully passed the two attention-check questions (N = 326, 76% women and 24% men, with a mean age of 18.7 years, SD = 1.80, range = 17 to 32 years). Participants reported their current religion as Catholic (22%), Protestant (23%), general Christian (13%), atheist/none (20%), with remaining participants reporting another religion (22%). Their ethnicity was White (37%), Asian (24%), Hispanic/Latino (25%), or other ethnic backgrounds (14%).

Procedure and Materials

Time 1 survey: Forecast emotion. At Time 1, about two weeks before their midterm exam, participants completed an online survey. They answered the same questions as in Study 1 concerning their expected grade and forecast emotion. Participants also completed the Satisfaction with Life Scale (α = .86).

Self-enhancement. Participants also completed the 20-item self-deceptive enhancement subscale from the Balanced Inventory of Desirable Responding (BIDR; Paulhus, 1994). The subscale measures the extent to which people hold unrealistically positive views of the self, inflating the positive and minimizing the negative (e.g., "I am a completely rational person," "I never regret my decisions"). Self-enhancement does not measure how much people up or down-regulate emotion or try to deceive others. Each item was rated on a scale from 1 *(not true)* to 7 *(very true).* Paulhus (1994) described two methods for assessing self-enhancement using the BIDR: dichotomous and continuous. We used the continuous method because higher Cronbach's alpha values, and higher convergent correlation with other measures of social desirability, have been found in studies that use continuous scoring (Stöber, Dette, & Musch, 2002). We reverse-coded negative valence items and then summed scores for each participant. Cronbach's alpha for this study, α = .64, was only slightly below the typical range observed in studies used to initially

validate the BIDR, α = .68 to .80 (Paulhus, 1988).

Time 2 survey: Experienced emotion. At Time 2, two days after receiving their exam grade, participants reported the grade they received. They reported whether that grade was lower than expected, higher than expected, or expected. They also reported the specific letter grade they expected. Participants answered the same questions as in Study 1 concerning their emotional experience and the importance of their exam grade.

Religion priming manipulation. At Time 2, participants answered the same questions about religion (importance, attendance, engagement) as in Study 1 (α = .89). We manipulated the salience of religion by randomly assigning half of the participants to answer the questions about religion immediately before reporting how they felt about their grade. Participants in the control condition answered the questions about religion at the end of the Time 2 survey. A recent meta-analysis found that this method of priming religion is effective across a variety of outcome measures (Shariff, Willard, Andersen, & Norenzayan, 2016).[4]

Emotion measures. As in Study 1, happiness and unhappiness were strongly negatively-correlated (all *r*s > -.64). Therefore, we created composite measures of forecast emotion, and experienced emotion, by subtracting ratings of unhappiness from happiness. Higher values indicated more happiness. To assess forecasting accuracy, we subtracted experienced emotion from forecast emotion.

Results and Discussion

At Time 2, after receiving their exam grade, participants rated their grade as important relative to their other goals (*M* = 5.17, *SD* = 2.29) and as important for their long-term goals (*M* = 5.35, *SD* = 2.40). On average, participants reported at Time 2 that they had expected a grade of B+, but the average received grade was B-.

Forecast and Experienced Emotion

As is Study 1, the correlation between forecast and experienced happiness was moderately strong, $r(313) = .67$, $p < .001$, indicating that participants were fairly accurate in forecasting the intensity of their emotional response to their exam grade (e.g., Lench et al., 2019). To assess the direction of forecasting bias, we conducted a mixed model ANOVA on happiness ratings. The within subject factor was emotion judgment (forecast happiness, experienced happiness). The between subject factors were grade outcome (higher than expected, lower than expected, expected grade) and experimental group (religion primed, not primed). The results showed only a main effect of grade outcome, $F(2, 309) = 471.03$, $MSE = 5700.27$, $p < .001$, $\eta^2_p = .75$. As Figure 1.1, Panel B, shows, participants who received a higher grade than expected, or their expected grade, forecast that they would feel happier about their grade than did participants who received a lower grade than expected; higher vs. lower: $t(314) = 21.88$, $p < .001$, $d = .39$, 95% CI [9.17, 10.98], expected vs. lower: $t(314) = 20.72$, $p < .001$, $d = .30$, 95% CI [7.89, 9.55]. Similarly, participants who received a higher grade than expected, or their expected grade, experienced more happiness than participants who received a lower grade; higher vs. lower: $t(313) = 16.59$, $p < .001$, $d = .29$, 95% CI [7.67, 9.74], expected vs. lower: $t(313) = 16.03$, $p < .001$, $d = .25$, 95% CI [6.81, 8.72]. No significant effects of emotion judgment or priming group were found. Thus, in contrast to Study 1, participants showed no significant bias when forecasting their emotional response to their exam grade.

Religion and Judgments about Emotion

Next, we examined associations between religiosity and judgments about emotion. In contrast to Study 1, across all participants, religiosity was not associated with forecasting more happiness about receiving a low exam grade, $r(313) = .09$, $p = .12$. As is Study 1, and replicating past research (e.g., Green & Elliott, 2010), religiosity was associated with reporting greater

satisfaction with life, $r(318) = .15$, $p = .006$.

We also examined how participants' religiosity was related to forecast and experienced happiness separately for students who received a lower grade than expected (58% of participants), and for students who received a higher grade (18%) or the grade they expected (24%). As in Study 1, for students who received a lower grade than expected, more religious participants forecast that they would feel happier about receiving a lower grade, $r(183) = .16$, $p = .03$. Despite this, and also replicating Study 1, religiosity was not associated with actually experiencing more happiness about their grade for the primed group, $r(89) = -.10$, $p = .38$, or for the control group, $r(96) = .06$, $p = .60$. Indeed, separate regression analyses showed no significant effect of religiosity, priming group, or their interaction on experienced emotion (all ps > .31) or forecasting bias (all ps > .08). Thus, more religious participants who received a lower grade than expected forecast that they would feel happier about their grade, but did not actually experience greater happiness, even when their religious identity was primed.

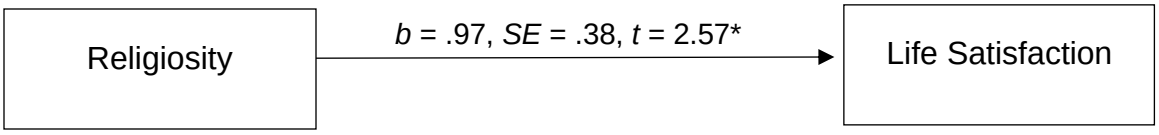
This investigation focused on religiosity and emotional responses to negative events. However, we also examined whether religiosity was associated with forecast or experienced happiness for participants who received either a higher grade than expected or the grade they expected. Participants in these two groups both forecast and experienced intense happiness (see Figure 1.1, Panel B), so we combined them for these analyses. No significant association was found between religiosity and forecast happiness, $r(128) = .14$, $p = .11$. Separate regression analyses showed no significant effect of religiosity, priming group, or their interaction on experienced emotion (all ps > .20) or forecasting bias (all ps > .08). These results did not change when we analyzed the higher grade and expected grade groups separately.

Self-Enhancement

Across all participants, religiosity was positively associated with self-enhancement, $r(308) = .13$, $p = .02$. Therefore, we assessed whether the associations between (a) religiosity and satisfaction with life, and (b) religiosity and forecast happiness, were explained by self-enhancement. To test this, we performed separate mediation analyses using Preacher and Hayes' (2008) bootstrapping method (model 4) with 5000 samples per test. As Figure 1.2 shows, across all participants, the association between religiosity and satisfaction with life was fully mediated by self-enhancement; Indirect effect = .32, *SE* = .15, 95% CI [.03, .61]. Specifically, participants who were more religious reported greater satisfaction with life, $b = 0.97$, *SE* = .38, 95% CI [0.23, 1.72], $t(306) = 2.57$, $p = .01$. Participants who were more religious also self-enhanced more, $b = 1.62$, *SE* = .71, 95% CI [0.22, 3.02], $t(306) = 2.27$, $p = .02$, and self-enhancement was associated with reporting greater satisfaction with life, $b = .21$, *SE* = .03, 95% CI [.15, .26], $t(306) = 7.26$, $p < .001$. When self-enhancement was included in the model, the association between religion and satisfaction with life was no longer significant, $b = 0.65$, *SE* = .36, 95% CI [-0.05, 1.35], $t(305) = 1.84$, $p = .07$, $P_m = .34$. The mediation ratio was .34, indicating that self-enhancement mediated approximately one-third of the total effect of religiosity on satisfaction with life (Ditlevsen, Christensen, Lynch, Damsgaard, & Keiding, 2005). Thus, Study 2 extended the findings of Study 1 by showing that the link between religiosity and reporting greater satisfaction with life was fully mediated by self-enhancement.

Because the results for religiosity are correlational, limiting causal inferences, we also examined the reverse mediation model. Religiosity did not mediate the relationship between self-enhancement and life satisfaction; Indirect effect = .01, SE = .005, 95% CI [-.003, .02], $t(308) = 1.35$, $p = .18$. Taken together, the mediation and reverse mediation models suggest that the

A. Direct Effect



B. Indirect Effect

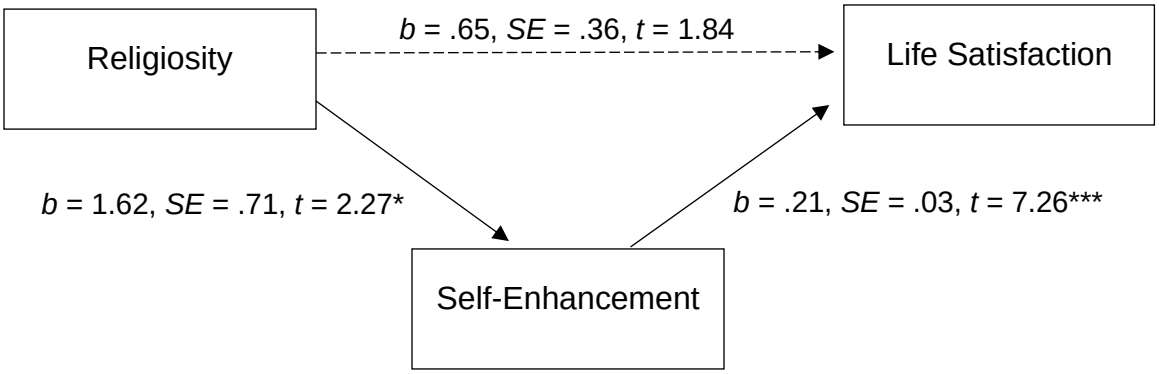


Figure 1.2. Self-enhancement fully explained the association between religiosity and reporting greater satisfaction with life. Unstandardized coefficients are presented. Panel A shows the total effect of religiosity on life satisfaction. Panel B shows the indirect effect of religiosity on life satisfaction through self-enhancement, *Adj*. R^2 = .15***; Mediated effect = .32, *SE* = .15, 95% *CI* [.03, .61]. *$p < .05$, ***$p < .001$.

mediation path proceeds from religiosity to satisfaction with life through self-enhancement. A second mediation model showed that, while there was a trend in the expected direction, self-enhancement did not mediate the relationship between religiosity and forecasting more happiness about a poor exam grade; Indirect effect = .08, *SE* = .06, 95% CI [-.05, .20].

In summary, Study 2 replicated and extended key findings from Study 1. In both studies, more religious participants who received a lower grade than expected forecast that they would feel happier about their grade, but they did not actually experience greater happiness. Study 2

further showed that, even when religious identity was primed, no association was found between participants' religiosity and their emotional experience following this concrete negative event. In both studies, religiosity was positively associated with reporting greater satisfaction with life. Study 2 further demonstrated that this association was fully mediated by self-enhancement. Findings from the two studies also differed in two ways, and the reasons for these differences are not known. First, although correlations between forecast and experienced emotion were moderately-high in both studies, participants overestimated the emotional impact of receiving a lower or expected grade in Study 1, but not in Study 2. Second, across all participants in Study 1, more religious participants forecast that they would feel happier about getting a lower grade than expected. In Study 2, this association between religiosity and forecast happiness was found only for the 58% of study participants who actually received a lower grade than expected.

General Discussion

Religiosity is commonly associated with effective coping with negative life events and enhanced well-being (e.g., Green & Elliott, 2010; Salsman et al., 2005). People who are religious may respond differently to negative events when they occur, use different emotion regulation strategies, and have greater access to social support (Vishkin et al., 2019). We extended this body of research by investigating an additional pathway from religiosity to positive judgments about emotion. Religious people's beliefs about how they expect or would like to feel as a member of their faith may lead them to augment positive feelings and minimize negative ones. In two studies, undergraduate students reported their forecast and experienced emotional response to receiving an exam grade, as well as their satisfaction with life. In the second study, we also experimentally varied the salience of religion and assessed self-enhancement. The results showed that more religious participants forecast that they would feel happier about receiving a lower

exam grade than expected, but did not actually experience greater happiness, even when their religious identity was primed. More religious participants also reported greater satisfaction with life, and this association was fully mediated by self-enhancement.

Affective Forecasting

In both studies, across participants, moderately high correlations were found between forecast and experienced emotional intensity (r = .71 in Study 1 and .67 in Study 2). This finding is consistent with recent research showing that the magnitude of forecasting bias depends on the feature of emotion being forecast, and that people are fairly accurate when forecasting the intensity of their future emotional experience (Doré et al., 2016; Levine et al., 2012; Lench et al., 2019). Despite being fairly accurate, participants in Study 1 overestimated the emotional impact of receiving a lower than expected grade or an expected grade, consistent with a large body of research showing an impact bias in affective forecasting (Gilbert et al., 2002; Wilson & Gilbert, 2003). In contrast, in Study 2, no significant overestimation was found for any grade outcome group.

Religion and Aspirational Judgments about Emotion

Religiosity was not associated with forecasting accuracy in either study. In both studies, however, participants who received a lower grade than expected forecast that they would feel happier about their grade. Yet, religious participants did not actually feel happier after receiving a lower than expected grade, even if their religious identity was made salient immediately before they reported their emotional experience. Judgments about immediate emotional responses are constrained by salient episodic memories. As a result, they are less susceptible to being swayed by beliefs and desires than are judgments about experiences that are temporally distant or abstract (Robinson & Clore, 2002). A possible alternative explanation for the finding that

religiosity did not augment experienced happiness is that people do not bring religion to bear when coping with low stakes events. However, students viewed their midterm exam grade as important relative to other goals in their lives and as important for the achievement of their long-term goals. It is also noteworthy that we assessed emotion judgments about the outcome of the first exam administered in the fall term in introductory psychology courses. For many students, this exam represented the first, or one of the first, tests of their ability to succeed in a college environment – an important personal milestone.

As found in past research, in both studies, more religious participants reported greater satisfaction with life (e.g., Diener et al., 2011; Van Cappellen et al., 2016). Extending past research, Study 2 demonstrated that this association was fully mediated by self-enhancement. Thus, religiosity was associated with reporting greater happiness and well-being when participants made temporally distant or abstract judgments about emotion but not when they judged their emotional response to a temporally-proximal, concrete negative event. Taken together, these findings suggest that the greater subjective well-being of more religious people reflects in part how they think they should feel, or how they ideally want to feel (Tsai et al., 2007), not how they actually do feel shortly after a concrete negative outcome.

These findings do not imply that the link between religion and well-being is illusory. Religiosity is a complex phenomenon. Evidence from a broad literature documents its beneficial effects for emotional well-being via positive reframing, providing meaning, providing social support, and promoting healthy lifestyles (Ano & Vasconcelles, 2005; Salsman et al., 2005; Spilka, Shaver & Kirkpatrick, 1985). Moreover, self-enhancement has also been associated with mental health benefits including being more content and creative (Taylor & Brown, 1988; for a competing perspective, see Colvin, Block & Funder, 1995). By assessing temporally distant and

abstract judgments concerning well-being, temporally-proximal and concrete emotional responses to a negative event, and self-enhancement, this investigation provides a more nuanced picture of when and why religion is associated with enhanced coping and well-being.

Self-enhancement mediated the link between religiosity and life satisfaction, but not between religiosity and forecast unhappiness. The greater abstractness of judgments about life satisfaction versus forecast emotion may account for this finding. Judgments of life satisfaction may be highly susceptible to enhancement because they permit a great deal of selectivity in deciding which features of life are relevant and how they should be weighed. In contrast, students forecast their feelings about a specific outcome. Thus, emotion forecasts may occupy a middle ground of abstractness between reports of life satisfaction and experienced emotion in that they involve judging feelings about a concrete event combined with temporal distance from that event.

Limitations and Future Research Directions

Limitations of the research should be also noted. The correlational study design limits our ability to draw causal inferences. However, a reverse mediation analysis showed that religiosity did not mediate the relationship between self-enhancement and life satisfaction. The strength of the associations found in the present studies was small, but consistent with a review showing that religiosity accounted for between 2 and 6 percent of the variance in adult subjective well-being, with a mean effect size of .16 (95% CI [.14, .25]). This association was weaker for younger adults (Witter et al., 1985), and participants in the present investigation were young adults. About three-fourths of the participants were women, which may limit the generalizability of these results. Finally, low power to detect significant associations prevented comparing individual religious or ethnic subgroups. However, replication of the main findings across two

studies, and the religious and ethnic diversity of our samples, strengthen our confidence in the results and suggest that they are not confined to a particular religious perspective or ethnic group.

This investigation represents an important step in understanding the associations between religiosity and positive judgments about emotion. Religious people may forecast feeling happier about negative events, and report feeling satisfied with their lives, because these feelings are valued by religion. Future studies should assess whether positive forecasts about negative events reflect how religious individuals expect to feel, or how they hope to feel (ideal affect), as a member of their group (Tsai et al., 2007). Future research should also examine specific beliefs shared by religious communities that may be associated with positive emotion judgments and self-enhancement. The current study included many first-year students with limited experience receiving grades on university exams. In prior research, affective forecasting biases have been found even for familiar outcomes (Ayton et al., 2007). Nonetheless, it will be useful to assess whether religiosity is associated with positive forecasts concerning negative outcomes that are more familiar. Finally, we found no difference in experienced happiness between more and less religious participants. Future studies should assess whether differences between more and less religious people in how they regulate emotion or find meaning in events leads to experiencing greater happiness immediately following negative outcomes in some contexts.

Conclusions

In conclusion, this research was the first to compare forecast and experienced emotion, and abstract judgments of life satisfaction, to better understand when religion is linked to enhanced coping and well-being. More religious students forecast that they would feel happier about receiving a poor exam grade. However, religiosity was not associated with actually feeling happier once they received their grades, indicating that the benefits of religion for well-being did

not extend to emotions experienced in the immediate wake of a negative event. Self-enhancement fully mediated the relationship between religiosity and satisfaction with life. Thus, maintaining high self-regard contributes to the association between religiosity and greater subjective well-being. These findings suggest that reports of enhanced coping and greater well-being among religious individuals stem partly from their expectations about how they will or should feel rather than from how they do feel after distressing events. Religions are aspirational. They provide practitioners with guidance concerning how they ought to behave as members of an important, identity-defining social group. Our findings reveal that religious aspirations extend to emotions and are related to how adherents expect to feel amidst adversity. These aspirations contribute to the positive association between religiosity and subjective well-being when emotion judgments are not constrained by the here and now.

Footnotes

[1]This investigation was part of a larger project and the first surveys in Studies 1 and 2 were lengthy, so we included two questions designed to identify inattentive respondents. Analyses in the text included data from all participants who successfully answered the two attention check questions. We also conducted analyses including participants who failed one or both attention checks. In Study 1, the pattern and statistical significance of the results did not change. Specifically, more religious students forecast that they would feel happier about receiving a lower grade than expected but did not experience more happiness after receiving a low grade. More religious students also reported greater satisfaction with life. In Study 2, the pattern and statistical significance of the following results did not change when participants who failed the attention check were included: Religiosity was not associated with experiencing more happiness after receiving a low grade, regardless of whether or not religion was primed. Greater religiosity was associated with reporting greater satisfaction with life. Two findings differed in Study 2 when participants who failed the attention check were included: A trend in the same direction was found but self-enhancement did not significantly mediate the link between religiosity and satisfaction with life; Indirect effect: $b = .23$, 95% CI [-.03, .51], $p = .08$. Also, the association between religiosity and forecasting more happiness was in the same direction but was not significant, $r(363) = .05$, $p = .35$.

[2]When multi-item measures are used, one item may be more strongly related to a dependent variable than other items. To test this, we computed the association between each of the three religiosity items and the three dependent variables: satisfaction with life, forecast happiness, and experienced happiness. The strength of the associations between the three religiosity items and these variables did not differ significantly (all ps > .07).

[3]Although we queried students about the specific letter grade they expected to receive, we asked them to forecast their emotional response to a positive or negative prediction error. What matters for this is what participants predicted at the time the event occurred. We analyzed the reaction participants had to getting a higher/expected/lower grade than expected, rather than their reaction to receiving a specific letter grade. As time passes and future events become more temporally proximate, it is common for people to change their expectations about outcomes related to that event (Shepperd, Ouellette, & Fernandez, 1996). For this reason, we analyzed data from participants who reported at Time 2 that they had received a lower grade than expected. The average expected grade in both studies was A- at Time 1 and B+ at Time 2, whereas the average received grade was a B in Study 1 and a B- in Study 2. Using Time 2 reports of expected grade to define the group that received a lower than expected grade ensured that participants were reporting their feelings about the negative outcome they had forecast.

[4]A recent meta-analysis showed that religious priming most reliably influences social judgment for religious individuals (Shariff et al., 2016). Because 20% of our sample reported no religious affiliation (selecting “atheist” or “none”), we conducted additional analyses excluding this group to find out whether priming religion altered participants’ judgments about emotion. The results showed that experienced happiness and self-enhancement ratings in Study 2 did not change when we excluded self-described atheists and “nones”, or when we excluded participants with minimum scores on the religiosity composite. Therefore, results are presented with all participants.

Supplemental Materials

Political conservatism. In both studies, we measured conservatism with a single item, "When considering your political beliefs, do you usually think of yourself as liberal or conservative?", using a scale from 1 (*strongly liberal*) to 7 (*strongly conservative*), with a midpoint of 4 (*neither*). In Study 1, across all participants, there was a moderate positive correlation between religiosity and conservatism, $r(403) = .47$, $p < .001$, and more modest positive associations between conservatism and life satisfaction, $r(405) = .15$, $p = .003$, and forecasting more happiness for a lower grade than expected, $r(380) = .12$, $p = .02$. When religion and conservatism were included together in a regression model, religion, $F(1, 399) = 3.84$, $p < .001$, $\eta^2_p = .04$, but not conservatism, $F(1, 399) = 0.90$, $p = .37$, $\eta^2_p = .00$, remained a significant predictor of life satisfaction. For the group that received a lower grade than expected, greater conservatism was not significantly associated with forecasting more happiness, $r(180) = .11$, $p = .16$, or with experiencing more happiness, $r(183) = -.06$, $p = .42$. We assessed forecasting accuracy by subtracting experienced happiness at Time 2 from forecast happiness at Time 1. Correlations between conservatism and this difference score showed that conservatism was not associated with forecasting bias, $r(176) = .10$, $p = .18$. Conservatism was associated with reporting greater satisfaction with life on the SWLS, $r(194) = .15$, $p = .04$.

In Study 2, across all participants, a moderate positive correlation was found between religiosity and conservatism, $r(318) = .49$, $p < .001$. Greater conservatism was associated with higher life satisfaction, $r(321) = .11$, $p = .04$, and more self-enhancement, $r(311) = .18$, $p = .002$, but it was not significantly associated with forecast happiness about getting a lower grade than expected, $r(316) = .03$, $p = .58$. As in Study 1, when religiosity and conservatism were included in the same regression model only religiosity, $F(1, 315) = 2.20$, $p = .03$, $\eta^2_p = .02$, but not

conservatism, $F(1, 315) = 0.49$, $p = .63$, $\eta^2_p = .00$, remained a significant predictor of life satisfaction. For the group who received a lower grade than expected, conservatism also was not associated with experienced happiness for participants in the religion prime condition, $r(90) = -.02$, $p = .85$, or in the control condition, $r(95) = -.10$, $p = .33$. Collapsing across the religion prime and control conditions, a nonsignificant association was found between conservatism and overestimation of happiness, $r(184) = .14$, $p = .06$. Conservatism was associated with reporting greater satisfaction with life, $r(187) = .20$, $p = .007$.

CHAPTER 3:

USING EMOTION TO GUIDE DECISIONS: MEDICAL STUDENTS FORECAST THEIR FEELINGS ABOUT CAREER CHOICES

Abstract

If people rely on inaccurate emotion forecasts to make decisions, this could lead them to make poor decisions. But reliance on forecasts, and accuracy, may vary across features of emotion. This study assessed how much participants relied on forecasts of emotional intensity, frequency, and duration to make major decisions. In Study 1, undergraduates reported relying more on forecast intensity than frequency or duration to decide which colleges to apply to. In Study 2, medical students reported relying more on forecast intensity than frequency or duration to decide how to rank residency programs. Medical students accurately predicted how intensely happy they would feel about their programs but overestimated the frequency and duration of happiness. Accuracy in forecasting emotional intensity predicted subsequent satisfaction with ranking decisions and programs during residency. This demonstration of reliance on, and accurate prediction of, future emotional intensity when making life-changing decisions provides important evidence that people are better forecasters than previously thought.

Using Emotion to Guide Decisions:

Medical Students Forecast their Feelings about Career Choices

People rely on forecast emotion to make decisions. They prioritize outcomes they expect to make them happy and avoid those they expect to make them unhappy (Mellers & McGraw, 2001; Morewedge & Buechel, 2013). Inaccuracy in forecasting of emotional experience is widely believed to be a source of bad decisions. But emotional experience is dynamic. Just as a musical note in a song can be loud or soft, occur more or less frequently, and last for a longer or shorter period of time, emotion can vary in intensity, frequency, and duration. To date, no research has investigated the features of their future emotional experience people attempt to forecast in order to make decisions. This is important because recent findings have revealed that people forecast some emotion features more accurately than others. Thus, this investigation contributes to affective forecasting theory by examining how much people rely on forecasts of emotional intensity, frequency, and duration to make life-changing decisions. Further, we assessed how accurately people can forecast each feature of emotion, and whether accurate forecasts of specific features predict later satisfaction with decisions. To investigate these issues, we conducted a study concerning the forecasts undergraduates relied on when deciding which colleges to apply to. We also conducted a longitudinal study of graduating medical students making career-defining decisions about how to rank order residency programs in preparation for being matched with a program.

Reliance on Forecasts of Specific Features of Emotion to Make Decisions

Affective forecasting plays an important role in decisions, ranging from whether to avoid being exposed to opposing political perspectives (Dorison, Minson, & Rogers, 2019) to what procedures to undergo to treat cancer (Perry, Hoerger, Korotkin, & Duberstein, 2020). But when

people consider how the outcomes of their decisions will make them feel, what features of their emotional experience do they try to anticipate? For example, when ranking potential residency programs, do medical students try to anticipate how intensely happy they will feel if they are matched with a particular program, how frequently they will feel happy, or how long their happy feelings will last?

There are compelling reasons to privilege forecasts of emotional intensity. The intensity of a person's emotional response to an outcome conveys important information about its value – how closely it aligns with the person's goals and the importance of those goals (Frijda, Ortony, Sonnemans & Clore, 1992). Anticipated intensity provides an index of how good or how bad an experience will be, whether one has the resources to cope with it, and the amount of effort it is worth expending to achieve or avoid it (Fredrickson, 2000). Moreover, people's global evaluations of past emotional experiences are heavily influenced by the peak and final intensity of those experiences, with duration playing a negligible role (e.g., Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). Thus, people may rely most on forecast intensity to make decisions because this feature of their emotional experience best conveys the value of an outcome. Although we anticipated that people would rely on forecasts of intensity to make decisions, there are also reasons they might prioritize forecasts of emotion frequency or duration to make decisions with lasting implications for their lives. The peak intensity of emotion is fleeting and people may perceive it as less consequential for their future well-being than the frequency or duration of happiness their choices will bring about (e.g., Diener, Sandvik, & Pavot, 2009). This investigation is the first to examine the extent to which people report relying on forecasts of specific features of emotion to make important choices.

Accuracy of Forecasts of Specific Features of Emotion

We also examined the accuracy with which people forecast specific features of their emotional experience and how accuracy was related to satisfaction with their decisions. Early investigations of affective forecasting showed that people are poor at predicting how they will feel in the future, and frequently overestimate the emotional impact of future events (e.g., Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998; Wilson et al., 2000). This tendency, known as the impact bias, has been demonstrated in a wide range of contexts (Gilbert et al., 2002). For example, students overestimated in forecasting both how happy and how unhappy they would feel on average over the course of their spring break vacations (Wirtz, Kruger, Scollon, & Diener, 2003). Workers overestimated how happy a higher income would make them feel (Kahneman, Krueger, Schkade, Schwarz, & Stone, 2006). Inaccurate forecasts can lead people to make poor decisions because they prioritize outcomes that do not ultimately make them happy.

There are several reasons that people overestimate when forecasting emotion. One cause is that people focus on central, salient features of the target event and neglect to consider more mundane features and events that will also occupy their attention in the future and mitigate their emotional response (Wilson et al., 2000). People also base forecasts of how they will feel in the future on their memories of how they felt in similar circumstances in the past. The most accessible memories are of those that were particularly emotionally intense. This too can lead to overestimating future emotion (Morewedge, Gilbert, & Wilson, 2005). People also fail to appreciate how quickly they adapt to events, particularly less preferred events, which further contributes to overestimating the emotional impact of future events (Wilson & Gilbert, 2008).

Recent research shows, however, that the impact bias is not as pervasive as previously thought, and that people are better at predicting some features of their emotional experience than

others. Lench and colleagues (2019) examined the affective forecasts of college students concerning their grades on a midterm exam, of U.S. citizens concerning the outcome of the 2016 presidential election, and of participants concerning a monetary loss in the laboratory. Across studies, participants were most accurate at forecasting the intensity of their emotions. They overestimated the frequency of their emotions and the effect events would have on their mood (also see Doré et al., 2016; Levine et al., 2012, 2013).

Why do people forecast the intensity of future emotion more accurately than other features of emotion? As noted above, people tend to focus on the most salient features of future events when forecasting how they will feel (Wilson et al., 2000). Similarly, when experiencing intense emotion, attention narrows to central, goal-relevant features of events at the expense of more peripheral features (Levine & Edelstein, 2009). Thus, the central features of events that come to mind when people forecast emotion are also likely to be salient when people experience the peak intensity of emotion, promoting accuracy. In addition, people's most accessible memories often concern emotionally intense experiences. Basing forecasts on these memories can lead to overestimating the frequency and duration of emotion but may promote accuracy in forecasting emotional intensity. Accuracy in forecasting the intensity of emotion would bode well for the quality of people's judgments and their satisfaction with their decisions, but only if they actually rely on anticipated emotional intensity to make decisions. People may instead base decisions on less accurate forecasts such as the frequency or duration of future emotion. Thus, determining what features of their future emotional experience people try to anticipate when making choices is essential for understanding the efficacy of human decision making.

The Present Investigation

To address these issues, we conducted two studies on the features of emotion people

forecast in order to make decisions. In Study 1, a pilot study, undergraduates reported how much they had relied on forecasts of different features of emotion when deciding which universities to apply to. In Study 2, we examined the affective forecasts and decisions of fourth year medical students. We assessed how much medical students relied on forecasts of the intensity, frequency, and duration of emotion to decide how to rank residency programs in preparation for being matched with a program. We also assessed the accuracy of their forecasts. One way of assessing the value of forecasts is to find out whether people later believe that the choices resulting from their forecasts were good ones. Therefore, we also assessed medical students' subsequent satisfaction with their decisions, both after they were matched with a residency program, and three months into their residency programs. Few studies track the outcomes of real-world decisions – a valuable contribution of this study.

We expected participants to report relying more on forecasts of emotion intensity than frequency or duration when making decisions about where to apply to college (Study 1) and how to rank residency programs (Study 2). This hypothesis was based on findings that emotional intensity signals the goal relevance of events, and figures prominently in global evaluations of past events. Consistent with recent research (Lench et al., 2019), we also expected medical students to forecast the intensity of happiness more accurately than the frequency or duration of happiness. To find out whether participants discriminate among these features of emotion, we examined how highly correlated these features were in their emotion judgments. Finally, we examined whether forecasts of specific features of emotion predicted satisfaction with ranking decisions and residency programs.

Study 1

We conducted a pilot study to explore the features of emotion people forecast in order to

make decisions. Participants completed an unrelated experiment on decision making. At the end of the online survey, they rated how much they had relied on forecasts of different features of emotion when deciding which universities to apply to for their college education. Data and software code are available at https://doi.org/10.17605/osf.io/qfxzw. The research was carried out in accordance with Institutional Review Boards (IRB) at the University of California, Irvine.

Method

Participants. Undergraduates (N = 404) from a large public university in California completed an online survey and were compensated with course credit. We excluded data from four participants who indicated after the study that they did not wish their data to be used. Participants were women (81%) and men (19%) who reported their ethnicity as Latino/a (28%), East Asian (27%), White (15%), Southeast Asian (14%), and other ethnic backgrounds (16%).

Procedure. Participants rated the degree to which they relied on forecasts of eight features of emotion when they decided which universities to apply to. They were instructed: "When you were deciding which universities to apply to for your college education, how important were your predictions about these features of your future emotional experience?" They rated reliance on each emotion feature from 1 *(not at all important when I made my decision)* to 9 *(extremely important when I made my decision)*. Participants first rated their reliance on forecasts of the intensity, frequency, and duration of positive and negative emotion they would feel if they were students at a university. Specifically, they rated, "How happy I'd feel as a student at that college (intensity)," "How long I'd feel happy as a student at that college (duration)," "How often I'd feel happy as a student at that college (frequency)," "How unhappy I'd feel if I was NOT a student at that college (intensity)," "How long I'd feel unhappy if I was NOT a student at that college (duration)," "How often I'd feel unhappy if I was NOT a student at

that college (frequency)." Decisions about where to apply might also be influenced by forecasts concerning their emotional experience as a student. Thus, participants also rated their reliance on forecasts of how being a student at a university would affect their day-to-day mood and their well-being.

Results

We first examined participants' reliance on forecasts of their emotional response to being students at a university. We conducted an ANOVA on reliance on forecast emotion for participants' application decision. Emotion valence (happiness, unhappiness) and emotion feature (intensity, frequency, duration) were within subject variables. The results showed a main effect of valence, $F(1, 399) = 200.90$, $MSE = 2145.15$, $p < .001$, $\eta^2_p = .33$ and a main effect of emotion feature, $F(2, 798) = 82.38$, $MSE = 146.58$, $p < .001$, $\eta^2_p = .17$. As Figure 2.1 shows, participants relied more on forecasts of positive emotion than negative emotion. Participants relied more on forecasts of intensity than frequency, both for happiness, $t(402) = 8.48$, $p < .001$, $d = .36$, 95% CI [0.58, 0.94], and for unhappiness, $t(401) = 9.16$, $p < .001$, $d = .27$, 95% CI [0.57, 0.89]. They also relied more on forecasts of intensity than duration, both for happiness, $t(402) = 8.06$, $p < .001$, $d = .36$, 95% CI [0.60, 0.99], and unhappiness, $t(401) = 8.35$, $p < .001$, $d = .25$, 95% CI [0.51, 0.82]. Thus, to make an important life decision, students reported relying more on forecasts of the intensity of emotion they would feel, than on forecasts of the frequency or duration of emotion they would feel, as a student at that college.

We then compared reliance on forecasts of how intensely happy they would feel as student at that college (the most relied upon feature, see Figure 2.1) with reliance on forecasts of their emotional experience as a student. Participants relied more on forecasts of how intensely happy they would feel as a student at that college ($M = 7.27$, $SD = 2.03$) than on forecasts of how

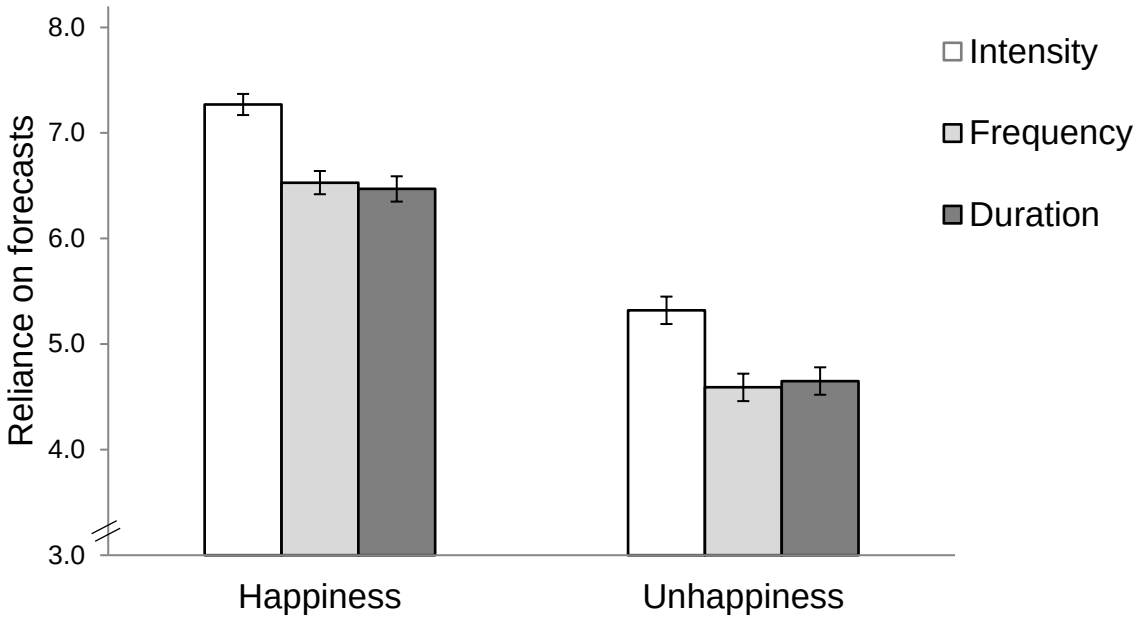


Figure 2.1. In Study 1, undergraduates relied more on forecasts of emotional intensity than frequency or duration when deciding which colleges to apply to for their undergraduate education. Error bars represent +/− 1 standard error.

being a student at that university would affect their day-to-day mood (M = 6.29, SD = 2.31), $t(399) = 9.66$, $p < .001$, $d = .45$, 95% CI [0.78, 1.18], or their well-being (M = 6.44, SD = 2.30), $t(399) = 8.08$, $p < .001$, $d = .38$, 95% CI [0.63, 1.03].

These findings provide preliminary evidence that, when making important life decisions, people rely more on forecasts concerning the intensity of emotion their choices will evoke than on other features of their future emotional experience. We extended this investigation in Study 2 by examining how much graduating medical students relied on forecasts of the intensity, frequency, and duration of emotion to decide how to rank residency programs. Further, we assessed the accuracy of their forecasts of each feature of emotion and their subsequent satisfaction with their decisions three months into their residency programs.

Study 2

During their final year of medical school, students undergo a competitive process known as “the Match”. The result of the Match determines where students will spend their residency training, setting the stage for the type of career they will have as physicians and significantly impacting their personal lives. After applying to programs and completing interviews, applicants rank order their choices for residency programs. Students’ ranking decisions have an impact on whether they match and on the specific program to which they are matched. Programs also rank order applicants. This information is sent to a centralized matching service that uses an algorithm to match students to residency programs. Students who are successful in matching find out which residency program they were matched with on the third Friday of March (“Match Day”) and are obligated to attend that program (Curtin & Signer, 2017).

Fourth year medical students completed three online questionnaires. After they had submitted their ranked list of residency programs, they reported the rank order decisions they had made. They also reported how much they had relied on forecasts of emotional intensity, frequency, and duration when they made these decisions. Participants then forecast the intensity, frequency, and duration of happiness they would feel the week after Match Day if they matched with different programs on their list**.** Participants completed a second questionnaire after Match Day, once they had learned the residency program to which they were matched. They reported the intensity, frequency, and duration of happiness they were experiencing, and their satisfaction with their ranking decisions. Participants completed a third questionnaire in October. They reported their satisfaction with their ranking decisions and with their residency program.

Method

This investigation was part of a larger project on emotion and decision-making (e.g.,

Lench et al., 2019; Levine et al., 2020). As part of the larger project, we assessed other aspects of medical student's forecasts, decision making, prior training, and appraisals about residency programs, that were not the focus of this paper. Hypotheses concerning the relative accuracy of forecasts of different features of emotion were preregistered as part of the larger project: https://osf.io/dwg4q/. Method and hypotheses for Study 2 were presented in the grant proposal that supported data collection. Data and software code are available online at https://doi.org/10.17605/osf.io/qfxzw. The research was carried out in accordance with the IRB at the University of California, Irvine.

Participants. Students (N = 178) completing their fourth year of medical school at a large public university in southern California participated in the study. Participants received financial compensation for completing three online surveys. All fourth-year medical students in two subsequent cohorts, who were participating in Match Day in March, were invited to take part. Data collection was planned for 200 participants, based on estimated enrollment rates across two years in the medical program. From an initial sample of 204 students, 182 students agreed to participate. We excluded data from four students who did not complete all three questionnaires, one of whom indicated not having matched. Participants were men (47%) and women (53%) whose ages ranged from 25 to 36 years, M = 28.02 years. Participants were single (31%), single in a lasting relationship (44%), married (22%), or separated or divorced (3%). Most did not have children (92%). They reported their ethnicity as Black (2%), East Asian (17%), Latino/a (13%), Middle Eastern (8%), Pacific Islander (2%), South Asian (11%), White (39%), or other (8%).

Procedure and materials: Time 1 questionnaire -- before Match Day. Participants were emailed a link to an online questionnaire on February 25th, a few days after the deadline for

submitting their rankings of residency programs. They completed the questionnaire by March 7, a week before Match Day.

Rank Order List (ROL). Participants indicated the top four residency programs on their Rank Order List and the specialty area (e.g., neurology). They rated how satisfied they were with their Rank Order List, from 1 (*not at all satisfied*) to 9 (*most satisfied possible*).

Reliance on forecasts of different emotion features. Participants rated how much they had relied on forecasts of different features of emotion to rank residency programs. They made a total of eight ratings: six ratings concerned how much they relied on forecasts of their emotional experience after being matched with a program, and two ratings concerned how much they relied on forecasts of their emotional experience as a resident. Specifically, participants were instructed, "To help them make difficult decisions, people may try to predict their future emotional experience – how the outcome of their decisions will make them feel. Emotional experience, like music, has several features. For instance, a particular musical note in a song can be gentle or strong (intensity), short or long (duration), and occur rarely or often (frequency). When you were deciding whether to rank a program highly on your ROL, how important were your predictions about these features of your future emotional experience?"

Following these instructions, participants rated how much they had relied on forecasts concerning the intensity, duration, and frequency of positive and negative emotion, using a scale from 1 (*not at all important when I made my decision*) to 9 (*extremely important when I made my decision*). Specifically, they rated, "How happy I'd feel if I match with that program (intensity)," "How long I'd feel happy if I match with that program (duration)," "How often I'd feel happy if I match with that program (frequency)," "How unhappy I'd feel if I do NOT match with that program (intensity)," "How long I'd feel unhappy if I do NOT match with that program

(duration)," "How often I'd feel unhappy if I do NOT match with that program (frequency)." Participants also rated their reliance on forecasts of how much being a resident in a program would affect their day-to-day mood and well-being.

Forecast emotion. Participants then forecast the intensity, frequency and duration of happiness they would feel, during an evening the week after Match Day, if they were matched with the program they had ranked first, second, third, and fourth or lower. We assessed forecast happiness because it is a common emotional response to an accomplishment with important implications for a person's professional life (Dyrbye et al., 2014). Participants were asked, "Suppose it's an evening during the week after Match Day, and you matched with the program you ranked [first / second / third / fourth or lower]:"

a) *Intensity*: "How will you feel about matching with that residency program? How intensely will you feel happy?" 1 (*not at all*) to 9 (*most extreme possible*).
b) *Frequency*: "How frequently that day will you feel happy about matching with the residency program you ranked [first / second / third / fourth or lower]?" 1 (*never*) to 9 (*constantly*).
c) *Duration*: "Overall, how much of the day will you spend in a mood that is happy?" (*0% - not at all*) to 10 (*100% - the entire day*).

To avoid having participants make an unreasonable number of forecasts, we limited forecasting questions to participants' emotional experience following match day. Adding forecasts concerning their mood and well-being during residency would have required participants to make five forecasts, rather than three, for each of their four top-ranked programs.

Time 2 questionnaire: After Match Day. Participants received a link to a second online questionnaire the day after Match Day and completed it during an evening within a week. They

reported the residency program to which they had been matched. Participants then rated how they were feeling about matching with that program. They responded to the same questions as they had when forecasting their emotional experience except that the wording was altered to indicate present tense (e.g., "How are you feeling about matching with that residency program? How intensely are you feeling happy?"). Participants again rated how satisfied they were with their rank order decisions, from 1 (*not at all satisfied*) to 9 (*most satisfied possible*).

Time 3 questionnaire: During residency. Participants completed a third questionnaire in October of the same year, approximately three months after they began their residency programs. They reported how satisfied they were with their rank order decisions, and with their residency program, from 1 (*not at all satisfied*) to 9 (*most satisfied possible*).

Results

All but one of the participants was matched with a residency program: 52% matched with their first ranked program, 19% with their second ranked program, 10% with their third ranked program, and 19% with a program ranked fourth or lower. Participants reported being very satisfied with the decisions they made about their Rank Order Lists before the match (M = 7.71, SD = 1.13), after the match (M = 7.67, SD = 1.66), and during residency (M = 7.49, SD = 1.57).

Reliance on forecasts of specific features of emotion to rank programs. Figure 2.2 shows how much participants reported relying on forecasts of different features of happiness and unhappiness to rank residency programs. We conducted an ANOVA on participants' reliance ratings with valence (happiness, unhappiness) and feature (intensity, frequency, duration) as within subject variables. The results showed significant effects of valence $F(1, 174) = 155.78$, $MSE = 1224.72$, $p < .001$, $\eta^2_p = .47$, feature, $F(2, 348) = 45.92$, $MSE = 98.17$, $p < .001$, $\eta^2_p = .21$, and their interaction, $F(2, 348) = 4.89$, $MSE = 5.01$, $p = .008$, $\eta^2_p = .03$.

Figure 2.2. In Study 2, medical students relied more on forecasts of emotional intensity than frequency or duration when ranking residency programs. Error bars represent +/− 1 standard error.

As Figure 2.2 shows, to rank programs, participants relied more on forecasts of how happy they would feel if they matched with a program than on forecasts of how unhappy they would feel if they did not match with a program. Participants also relied more on forecasts of the intensity of emotion to rank programs than on forecasts of the frequency or duration of emotion. Specifically, they relied more on forecasts of intensity than frequency, both for happiness, $t(176) = 7.36$, $p < .001$, $d = .59$, 95% CI [0.87, 1.50], and for unhappiness, $t(176) = 5.61$, $p < .001$, $d = .27$, 95% CI [0.46, 0.97]. They also relied more on forecasts of intensity than duration, both for happiness, $t(177) = 6.40$, $p < .001$, $d = .52$, 95% CI [0.73, 1.38], and unhappiness, $t(175) = 5.20$, $p < .001$, $d = .26$, 95% CI [0.42, 0.93]. No difference was found between reliance on frequency and duration for happiness, $t(176) = -1.01$, $p = .31$, $d = .06$, 95% CI [-0.37, 0.12], or unhappiness,

$t(176) = -.86$, $p = .39$, $d = .02$, 95% CI [-0.20, 0.08]. The interaction between valence and feature indicated that, although participants relied significantly more on forecast intensity than frequency or duration for both happiness and unhappiness, this difference was more pronounced for happiness than for unhappiness.

We then compared participants' reliance on forecasts of how intensely happy they would feel if they matched with a program (the most relied upon forecast) with their reliance on forecasts of their emotional experience as a resident. Participants relied more on forecasts of how intensely happy they would feel if they matched with a program ($M = 7.73$, $SD = 1.62$) than on forecasts of how being a resident in a program would affect their day-to-day mood ($M = 7.12$, $SD = 1.81$), $t(177) = 4.91$, $p < .001$, $d = .35$, 95% CI [0.37, 0.86], or their well-being ($M = 7.07$, $SD = 1.80$), $t(177) = 5.27$, $p < .001$, $d = .38$, 95% CI [0.41, 0.90]. Thus, to make career decisions with lasting consequences, participants attempted to forecast the intensity of happiness they would feel if they matched with different programs.

Accuracy of Forecasts of Specific Features of Emotion

At Time 1, medical students forecast the intensity, frequency, and duration of happiness they would feel after Match Day if they matched with different programs on their list**.** At Time 2, after Match Day, they reported the intensity, frequency, and duration of happiness they were experiencing. We examined the accuracy of their forecasts in two ways: by examining the direction of bias and by examining overall inaccuracy independent of the direction of bias.

Direction of bias. First, we assessed the extent to which participants over- or underestimated in forecasting their emotional experience after Match Day. Table 2.1 shows the intensity, frequency, and duration of happiness that participants forecast and experienced, with paired *t*-tests comparing forecasts to experience. Participants showed no significant bias for

Table 2.1. *Mean Forecast and Experienced Happiness by Emotion Feature for the Week after Match Day in Study 2 (N = 178)*

	Forecast happiness		Experienced happiness		
Emotion feature	*M*	*(SD)*	*M*	*(SD)*	Paired *t*
Intensity	7.64	(1.56)	7.53	(1.72)	1.07
Frequency	7.27	(1.57)	7.00	(1.84)	2.22*
Duration	6.93	(2.15)	6.21	(2.60)	4.36***

*$p < .05$. ***$p < .001$.

forecasts of the intensity of happiness, but they overestimated how frequently they would feel happy, and how long their happy feelings would last.

Overall inaccuracy. The direction of bias can mask overall inaccuracy if some participants overestimate and others underestimate. So we also assessed overall inaccuracy, independent of the direction of bias, by computing the absolute value of the difference between forecast and experienced emotion. Lower values indicate greater accuracy (i.e., less difference between forecasts and experience). We conducted a mixed model ANOVA on overall inaccuracy scores with feature (intensity, frequency, duration) as the within subject variable. In this analysis, we included participants' ranking of the residency program to which they were matched (1^{st} choice, 2^{nd} choice, 3^{rd} choice, 4^{th} or lower choice) to find out whether they were more inaccurate when forecasting their reactions to more disliked outcomes.

The results showed a main effect of feature, $F(2, 352) = 9.31$, $MSE = 11.22$, $p < .001$, $\eta^2_p = .05$. Participants forecast the intensity of happiness ($M = 0.89$, $SD = 1.08$) more accurately than the frequency of happiness ($M = 1.12$, $SD = 1.19$), $t(177) = 2.57$, $p = .01$, $d = .21$, 95% CI [0.05,

0.42], and the duration of happiness (M = 1.62, SD = 1.62), $t(177) = 5.98$, $p < .001$, $d = .52$, 95% CI [0.49, 0.98]. They forecast the frequency of happiness more accurately than the duration of happiness, $t(177) = 3.81$, $p < .001$, $d = .35$, 95% CI [0.24, 0.76]. A main effect of program rank was also found, $F(1, 176) = 25.60$, $MSE = 62.77$, $p < .001$, $\eta^2_p = .13$. Matching with a more disliked program was associated with greater inaccuracy in forecasts of all three features: intensity, $r(178) = .43$, $p < .001$; frequency, $r(178) = .21$, $p = .005$; duration, $r(178) = .20$, $p = .008$. In summary, consistent with prior research, medical students overestimated when forecasting the frequency or duration of happiness they would feel after Match Day. As hypothesized, however, their forecasts of the intensity of happiness were less biased and more accurate than forecasts of frequency or duration. Participants also showed greater overall inaccuracy when forecasting more disliked outcomes.

Differentiation of emotion features. To confirm that participants were actually able to discriminate among emotion features, we examined correlations among their reports of the intensity, frequency, and duration of happiness. For participants' reports of reliance on forecasts of different features of happiness, correlations among features were moderate, with an average correlation of .55: $r_{int*freq} = .43$, 95% CI [.30, .54]; $r_{int*dur} = .41$, 95% CI [.28, .52]; $r_{freq*dur} = .74$, 95% CI [.67, .80]. The average coefficient of determination (i.e., R^2, the proportion of variance in reports of one feature that could be attributed to the other features) was approximately 0.30. Thus, an average of 70% of the variance in reliance on each feature was not explained by the other two features.

For forecast happiness concerning Match Day, correlations among features were moderate to high: $r_{int*freq} = .84$, 95% CI [.79, .88]; $r_{int*dur} = .63$, 95% CI [.53, .71]; $r_{freq*dur} = .67$, 95% CI [.58, .75]. The average correlation between features was .73, and $R^2 = 0.53$. Thus, on

average, 47% of the variance in reports of one emotion feature was not explained by the other two features. For experienced happiness concerning Match Day, correlations among features were also moderate to high: $r_{int*freq}$ = .71, 95% CI [.62, .77]; $r_{int*dur}$ = .70, 95% CI [.61, .76]; $r_{freq*dur}$ = .66, 95% CI [.57, .73]. The average correlation among features was .69, and R^2 = 0.47. Thus, on average, 53% of the variance in reports of one emotion feature was not explained by the other two features. These findings suggest that participants made distinctions between emotional intensity, frequency, and duration, with approximately 47 - 70% of variance in reports of each feature of emotion not explained by the other two features.

Forecasting accuracy and decision outcomes. People engage in affective forecasting in order to make satisfying decisions. In a final set of analyses, we examined whether the accuracy of forecasts of different emotion features predicted four decision outcomes: (1) the rank of the program to which participants were matched (1st choice, 2nd choice, 3rd choice, 4th choice or lower); (2) how satisfied they were with their ranking decisions after Match Day; (3) how satisfied they were with their ranking decisions during residency; and (4) how satisfied they were with their program during residency. To find out whether accuracy in forecasts of intensity, frequency, or duration made a unique contribution to decision outcomes, we conducted a separate regression analysis for each outcome with forecasting accuracy for all three emotion features entered simultaneously as predictors. Program rank was entered as an additional covariate in each model except the first, to eliminate this potential confound. The results are shown in Table 2.2. As a reminder, forecasting accuracy was assessed by computing the absolute value of the difference between forecast and experienced happiness. Thus, lower values indicate greater accuracy.

Table 2.2. *Regression Models Assessing Whether Accuracy in Forecasting Specific Features of Happiness Predicted Positive Decision Outcomes in Study 2*

Outcome and predictors	β	*B*	*SE B*	*t*
Program rank[1]				
Intensity	.39	.43	.08	5.06***
Frequency	.03	.03	.08	0.34
Duration	.07	.05	.05	0.94
R^2 and *F* values	$R^2 = .19$, $F(3, 174) = 13.27$, $MSE = 15.25$, $p < .001$			
Satisfaction with decisions after Match Day				
Intensity	-.08	-.12	.12	-1.00
Frequency	-.08	-.12	.10	-1.14
Duration	-.25	-.25	.07	-3.52***
Program Rank	-.30	-.42	.10	-4.09***
R^2 and *F* values	$R^2 = .25$, $F(4, 173) = 14.55$, $MSE = 30.56$, $p < .001$			
Satisfaction with decisions during residency				
Intensity	-.13	-.19	.13	-1.47
Frequency	.07	.09	.11	0.81
Duration	-.22	-.22	.08	-2.78**
Program Rank	-.17	-.23	.11	-2.04*
R^2 and *F* values	$R^2 = .13$, $F(4, 160) = 6.10$, $MSE = 13.33$, $p < .001$			
Satisfaction with program during residency				
Intensity	-.28	-.36	.12	-2.99**
Frequency	.19	.23	.10	2.24*
Duration	-.10	-.09	.07	-1.31
Program Rank	.06	.08	.10	0.75
R^2 and *F* values	$R^2 = .08$, $F(4, 161) = 3.55$, $MSE = 6.59$, $p = .008$			

Note. Forecasting accuracy was assessed by calculating the absolute value of the difference between forecast and experienced happiness; lower values indicate greater accuracy. [1]Lower rank (1st choice, 2nd choice, 3rd choice, 4th or below choice) indicates that students matched with a more preferred program. *$p < .05$. **$p < .01$. ***$p < .001$.

As Table 2.2 shows, the regression model predicting program rank and including all three features was significant. More accurate forecasts of how intensely happy participants would feel after Match Day were associated with being matched with a more preferred program. The accuracy of frequency and duration forecasts did not significantly predict matched program rank. The regression models predicting satisfaction with ranking decisions, both after Match Day and during residency, were significant. For both outcomes, more accurate forecasts of the duration of happiness predicted greater satisfaction with ranking decisions. The accuracy of intensity and frequency forecasts did not predict satisfaction with ranking decisions. Finally, the regression model predicting participants' satisfaction with their programs during residency was significant. More accurately forecasting emotional intensity was associated with greater satisfaction with the program during residency. Surprisingly, *less* accurate frequency forecasts were associated with greater satisfaction with the program. The accuracy of duration forecasts did not predict satisfaction with residency program.

In summary, greater accuracy in forecasting the intensity of happiness was associated with matching with a more favored program and satisfaction with residency program, even after taking into account accuracy in forecasting the duration and frequency of happiness. Accuracy in forecasting the duration of happiness was related to greater satisfaction with ranking choices after Match Day and during residency. Accuracy in forecasting the frequency of happiness was not associated with positive outcomes.

Discussion

Accuracy in forecasting emotion is thought to be important for making good decisions. Much of the early affective forecasting research suggested that people are poor at forecasting how they will feel and overestimate the emotional impact of future events (Ayton et al., 2007;

Gilbert et al., 2002; Smith et al., 2008). This bias can be motivating (Morewedge & Buechel, 2013; Shepperd et al., 2000) but may also lead people to squander effort and resources pursuing positive outcomes that do not make them as happy as anticipated and avoiding negative outcomes that do not make them as unhappy as anticipated. In contrast to this early view, recent work shows that people forecast emotional intensity more accurately than other features of emotional experience (e.g., Doré et al., 2016; Levine et al., 2012, 2013; Lench et al., 2019). This greater accuracy only matters if people actually rely on forecasts of this feature of emotion to make decisions. Thus, the current investigation advances affective forecasting theory by examining the specific features of emotion people forecast in order to make decisions of lasting importance for their lives.

People Relied More on Forecasts of Emotional Intensity than Frequency or Duration

In Study 1, undergraduates reported relying more on forecasts of emotional intensity than frequency or duration in order to decide which colleges to apply to. In Study 2, medical students reported relying more on forecasts of emotional intensity than frequency or duration in order to decide how to rank residency programs in preparation for being matched with a program. This trust in forecast intensity appears to have been justified. Medical students' forecasts of how intensely happy they would feel about matching with a specific residency program were more accurate overall than their forecasts of how frequently they would feel happy or how long their feelings would last. When we examined the direction of bias, students showed no significant over- or underestimation in forecasting how intensely happy they would feel after finding out the program to which they were matched. In contrast, consistent with prior research (e.g., Gilbert et al., 1998), they overestimated the frequency and duration of happiness about their match. Analyses of correlations among medical students' reports of the intensity, frequency, and

duration of emotion provided further evidence of their ability to differentiate among features of emotion. Only about half of the variance in reports of one emotion feature could be explained by the other features (also see Lench et al., 2019).

In summary, Match day is the culmination of students' years in medical school and its outcome has implications that range from whether students will receive professional training in their preferred specialty to whether they will live near family and friends. The week after this pivotal event, students rated their feelings as intense, frequent, and enduring. Their ability to accurately forecast the intensity of those feelings suggests that intensity is a particularly salient feature of emotion which is easy to envision. Their reliance on intensity forecasts for making decisions suggests that emotional intensity conveys meaningful information about the importance of outcomes for people's goals (Fredrickson, 2000; Kahneman et al., 1993).

Accuracy in Forecasting Emotional Intensity Predicted Positive Decision Outcomes

In Study 2, we examined whether greater accuracy in medical students' forecasts predicted four important downstream outcomes: matching with a more preferred residency program, being satisfied with their ranking decisions after Match Day, being satisfied with their ranking decisions during residency, and being satisfied with their program during residency. To identify the unique relation of forecasts of each feature of emotion to these outcomes, we included forecasts of the intensity, frequency, and duration of happiness in the same regression models. Controlling for the accuracy of forecasts of other emotion features, more accurate forecasts of emotional intensity predicted being matched with a more favored program and satisfaction with one's residency program. Accuracy in forecasting the duration of happiness was related to greater satisfaction with ranking decisions but not with satisfaction with the program itself during residency. Accuracy in forecasting the frequency of happiness was not associated

with positive outcomes after controlling for the accuracy of forecasts of other emotion features.

The Accessibility and Value of Judgments about Emotional Intensity

Several factors may contribute to people's greater reliance on, and accuracy of, forecasts of emotional intensity relative to frequency or duration. First, people may rely on forecast intensity to make decisions because it often, though not always, conveys information about other emotion features. For example, the intensity of distress a person feels over the loss of a job conveys information about how often and how long the person will be distressed. The intensity of joy a couple feels at their wedding may foretell the frequency and duration of happiness in their marriage. Of course, it is not at all hard to come up with exceptions. People's tendency to assume that the intensity of their emotional response conveys information about other emotion features, in cases when it does not, likely contributes to inaccuracy in forecasts of emotion frequency and duration (Gilbert et al., 1998).

Second, the focus of people's attention may be similar when they forecast, and later experience, the peak intensity of their emotional response to an event. In both cases, attention narrows to central, goal-relevant characteristics of the event (e.g., Levine & Edelstein, 2009). This common focus of attention would promote more accurate forecasts (e.g., Levine et al., 2012, 2013; Levine et al., 2018). In addition, emotional intensity reflects event importance, which remains relatively stable over time (McAdams & Olson, 2010; Lench et al., 2019). In contrast, the frequency and duration of emotion depend, not just on the importance of the focal event, but also on concurrent events, thoughts, and regulatory processes that are harder to anticipate. People overestimate the frequency of future emotion because they neglect to consider other future events that will compete for their attention. As a result, they exaggerate how often they will think about the target event in the future (Lench et al., 2019; Wilson et al., 2000).

A final reason for greater reliance on, and accuracy of, forecasts of emotional intensity may be that this feature of emotion is particularly memorable. To forecast how they will feel in the future, people draw on memories of how they felt during similar experiences in the past (Shepperd et al., 2000). Global affective evaluations of past events privilege the peak intensity of emotion experienced during events and the intensity experienced at the end of events (Fredrickson, 2000). Thus, people may forecast emotional intensity accurately because their forecasts are based on remembered evaluations of past events, which are heavily informed by peak and end intensity. Failure to encode the duration of their emotional responses to past experiences (e.g., Ariely & Loewenstein, 2000) may hinder people's ability to forecast the frequency and duration of emotion.

Limitations and Future Directions

These findings suggest that affective forecasts of emotional intensity are both valued, and especially valuable, when people are making decisions. However, our ability to draw causal inferences is limited by the correlational nature of the data. In future studies, the impact of forecasts on the quality of decisions could be assessed after priming participants to focus on either the intensity, frequency, or duration of future emotion. Future studies should examine whether people also rely more on forecast emotional intensity than frequency and duration when making decisions outside of achievement contexts and concerning negative outcomes. The current findings also point to fruitful avenues of research on ideal affect – the emotions that people value and prefer to experience. Evidence shows that ideal affect varies across cultures. East Asians prefer low-arousal positive states, such as feeling calm, while Americans prefer high-arousal positive states like excitement (Tsai, 2007). Future studies should explore whether greater reliance on forecasts of emotional intensity when making decisions is consistent across

cultures. In both studies, participants reported relying more on positive emotion than on negative emotion for their decisions. These valence effects were substantial. For example, in Study 2 the effect size for reliance on positive versus negative emotion was double that for reliance on intensity versus frequency and duration (d = .52 vs .26). The greater reliance on positive emotion may simply be due to participants viewing the outcome they experienced as a positive one. Future studies should assess whether reliance on negative emotion will be greater for negative events.

Conclusions

Our findings advance affective forecasting theory on several fronts. This investigation was the first to demonstrate the features of emotion people forecast in order to make important decisions with lifelong consequences for themselves and their families. Whether deciding which colleges to apply to (Study 1) or how to rank medical residency programs in preparation for being matched with a program (Study 2), participants relied more on forecasts of emotional intensity than on forecasts of emotion frequency or duration. It is wise to privilege judgments about the intensity of future emotion only if these judgments are accurate. We found, however, that people were more accurate when forecasting emotional intensity than frequency or duration. Moreover, greater accuracy in forecasting intensity of happiness predicted some positive outcomes, controlling for accuracy in forecasting other emotion features. Overall, then, intensity forecasts were relied upon more for making decisions, they were more accurate, and in some cases they were related to favorable decision outcomes. The results highlight the importance of emotional intensity in affective forecasting and for decision making. Taken together, these findings bode well for the quality of people's judgments and suggest that some of the pessimism that has dominated research on affective forecasting is unwarranted.

CHAPTER 4:

THE VIVIDNESS OF FORECAST EMOTION MOTIVATES GOAL-DIRECTED ACTION

Abstract

People strive to attain outcomes that they forecast will to make them happy and avoid ones they forecast will make them miserable. Given that affective forecasts can be mistaken, what makes them so motivating? To find out, we examined the characteristics of forecasts that predicted goal-directed behavior. Participants (N = 338) reported their forecast, experienced, and remembered emotional response to a negative outcome – being denied an opportunity to earn money. We manipulated the importance of the outcome by varying whether participants could earn $5 or $100. We also assessed how long participants spent answering questions in order to qualify to earn the money. The results showed that participants were poor judges of the accuracy of their forecasts. They remembered their emotional response more accurately than they forecast it. Yet they perceived their forecasts to be more accurate and vivid than their memories. Across importance conditions, the more participants viewed the outcome as important, the less accurately they forecast their emotional response, but the more accurate and vivid they perceived their forecasts to be. The vividness of forecasts predicted time spent answering questions. In contrast, adjusting for vividness, the intensity, actual accuracy, and perceived accuracy of forecasts did not predict behavior. These findings suggest that, when the stakes are high, the vividness with which future emotion comes to mind makes people perceive their forecasts to be more accurate than they really are and motivates goal-directed action.

The Vividness of Forecast Emotion Motivates Goal-Directed Action

People spend much of their time remembering the past and anticipating the future (D'Argembeau, Renaud, & Van der Linden, 2011). They engage in mental time travel, bringing to mind episodic details of past experiences in order to simulate how future events may unfold (Schacter, Addis, & Buckner, 2008; Szpunar, 2010). On these travels, emotion is a frequent stop. Representations of past and future emotion motivate people's efforts to attain important goals. The more important the outcome, the greater the intensity of emotion people forecast, and the harder they work to attain or avoid an outcome (Mellers, Schwartz, & Ritov, 1999; Miloyan & Suddendorf, 2015; Morewedge et al., 2005). Emotion memories and forecasts can be wrong, however, leading people to squander valuable resources pursuing outcomes that fail to maximize their well-being. This raises the following questions: How accurately can people forecast and remember their emotions? How accurate do people perceive their forecasts and memories of emotion to be? Given that affective forecasts can be inaccurate, what makes them so motivating?

How Accurately Can People Forecast and Remember their Emotional Experience?

Differences between forecasts and memories provide important clues about how much people *should* trust their emotion forecasts and memories to be accurate versus how much they *do* trust them and rely on them to make decisions. One difference is that people can retrieve episodic details concerning past emotional experiences in a fairly direct manner (Robinson & Clore, 2002). Episodic details are available when people remember how they felt about a past event. Mental representations of past emotional experience are based partly on retrieved episodic details of their experience and partly on current appraisals and feelings about the event that evoked emotion (Kaplan, Levine, Lench, & Safer, 2016; Levine, 1997; Levine et al., 2020, 2021; Robinson & Clore, 2002). In contrast, future events are uncertain. As a result, forecasting how

they will feel about a future emotional experience requires a more elaborate, constructive process that draws on both past experience and imagination (Schacter & Addis, 2007; Levine et al., 2020). People must base their forecasts on the retrieved details of past events judged to be similar to the anticipated outcome (Schacter & Addis, 2007). In comparison to remembering emotion for a past event, people also rely more on semantic knowledge and appraisals when they imagine how a future event might play out (Berntsen & Bohn, 2010; Kane, Van Boven & McGraw, 2012; Özbek, Bohn, & Berntsen, 2016). Thus, it seems obvious that people should be able to remember how they felt in the past more accurately than they can forecast how they will feel in the future.

How Accurate and Vivid Do People Perceive Emotion Forecasts and Memories to Be?

Given that remembered emotional experiences already happened, if people are well-calibrated, they should also perceive their memories to be more accurate than their forecasts. But past research suggests that people may be poor judges of the accuracy of their representations of future and past emotion. People frequently rate future events as more important than past events (Seligman, Railton, Baumeister, & Sripada, 2013; Van Boven & Caruso, 2015). This may be because they can prepare for and influence future outcomes, whereas past events are unchangeable (Van Boven, Kane, & McGraw, 2009). Further, as time passes, future events become more imminent and pressing whereas past events recede and their impact is reduced by cognitive accommodation and emotion regulation (Van Boven & Caruso, 2015; Wilson & Gilbert, 2008). Because future events are experienced as more important, emotionally evocative, and pressing than past events, people may perceive their anticipated emotional reaction to a future event to be more vivid and accurate than their remembered emotional reaction to a past event.

We define vividness as how easily representations of emotion come to mind, how strongly representations of future or past emotion evoke feelings in the present, the extent to which they are accompanied by a sense of pre- or reliving an experience, and the amount of detail included (Winkielman, Schwarz, & Belli, 1998). Forecasts and memories of experiences that are viewed as more important are often perceived to be more vivid (Cole & Berntsen, 2016; Lehner & D'Argembeau, 2016; Rubin, 2014; Van Boven & Ashworth, 2007). In turn, when representations are vivid, people often perceive them to be more accurate (Benjamin et al., 1998; Kelley & Jacoby, 1990). In summary, the greater importance ascribed to future emotional experiences may make affective forecasts more vivid than memories of past emotional experiences. Greater vividness, in turn, may lead people to perceive their forecasts to be more accurate than their memories. Thus, the emotionally evocative and vivid nature of mental representations of important events may lead to a paradoxical result, where emotion forecasts are less accurate than memories but are perceived to be more accurate. If emotion forecasts are less accurate for more important events overall, this could lead to a second paradoxical result. For highly important events, forecasting accuracy may be low yet be perceived to be high. In contrast, when the stakes are low this relationship may be reversed.

Consistent with this view, Levine et al. (2020) had participants report their predicted, experienced, and remembered emotional response to the outcome of the 2016 U.S. presidential election. They also reported how accurate and vivid they perceived their forecasts and memories to be, and the importance of the election. Participants remembered their emotional responses more accurately than they predicted them. Nevertheless, they perceived their predictions to be more accurate than their memories. This misperception was explained by the greater importance and vividness of forecast versus remembered emotional experience. These findings were

correlational, however, so the causal relations between event importance and the perceived accuracy and vividness of mental representations of emotion, remain unclear. In addition, the investigators did not assess the aspects of affective forecasts that motivate goal-directed action. The present experiment aimed to fill these gaps in the literature by manipulating the importance of an outcome. This allowed us to assess the effects of event importance on the intensity, actual accuracy, perceived accuracy, and vividness of forecast and remembered emotion. We also assessed which of these characteristics of affective forecasts motivate goal-directed behavior.

What Characteristics of Forecasts Motivate Goal-Directed Action?

Behavioral decision theory, which emerged in the 1960's, emphasized the role of cognition in decision making (Edwards, 1961). Many decisions were shown to hinge on heuristics which served to simplify complex decisions but often led to errors (Tversky & Kahneman, 1974). This tradition revealed important factors that contribute to the decisions people make, but largely neglected the role of emotion. Models of decision making that included affect proved to have greater power to predict and explain behavior (Mellers et al., 1997). Emotion also plays an important role in the quality of decisions that people make. When a person's ability to experience emotions is clinically impaired due to damage of the amygdala or ventromedial prefrontal cortex, they make suboptimal decisions in risky choice scenarios (Bechara, Damasio, Tranel, & Damasio, 1997).

People are aware of the importance of emotion for making decisions. Nearly nine in ten of people undergoing cancer treatment perceived affective forecasts to be important for their treatment decisions (Perry et al., 2020). Moreover, the intensity of forecast emotion has been shown to predict behavior. Women at high risk of breast cancer who anticipated feeling more stressed if they took recommended chemoprevention medications were more likely to opt against

using those medications (Hoerger, Scherer, & Fagerlin, 2016). In a laboratory setting, experimentally increasing the intensity of happiness people forecast they would feel if they won a monetary prize led them to study more for a memory test and spend more time performing a repetitive task (Morewedge & Buechel, 2013). A recent meta-analysis confirmed that forecast emotion was consistently associated with behavior (DeWall et al., 2016).

What is not yet known is what characteristics of affective forecasts motivate goal-directed action. To more fully understand the role that affective forecasts play in decision making, it is important to distinguish between the intensity and vividness of forecast emotion. The *intensity* of forecast emotion refers to people's cognitive judgment about how a future event will make them feel (e.g., how happy a person expects to feel on an upcoming vacation). The vividness of forecast emotion refers to the present experience that accompanies that judgment (e.g., how easily and powerfully the person's future emotional experience comes to mind in the present). These characteristics are doubtless related. But irrespective of the intensity of emotion people expect to feel, their present experience when forecasting may be hazy and abstract or accompanied by strong emotion and a sense of pre-experiencing the event in the present. Loewenstein and Lerner (2003) made a similar distinction between *anticipated emotion,* a cognitive judgment about future emotion, and *anticipatory emotion,* the emotion a person feels in the moment when they anticipate what may occur in the future (e.g., the feeling of excitement and happiness in the present when contemplating their vacation).

Which of the components of affective forecasts motivate behavior – their intensity, actual accuracy, perceived accuracy, or vividness? A recent meta-analysis showed a positive association between the vividness of communications intended to persuade and people's behavioral intentions (Blondé & Girandola, 2016). Vivid materials are also persuasive in

courtroom settings (Bell & Loftus, 1985). Experiences that are important for attaining goals tend to be accompanied by vivid (Cole & Berntsen, 2016; Lehner & D'Argembeau, 2016) and emotionally evocative (Van Boven & Ashworth, 2007) mental representations. We propose that forecasts about important future events are highly vivid, and this motivates behavior to achieve or avoid outcomes. To investigate the relationship between event importance, the vividness and intensity of mental representations, and behavior, we manipulated the importance of an event in a controlled experiment.

In summary, people are aided by the availability of episodic details when remembering how they felt in the past. In contrast, they need to engage in a more elaborate process, partly informed by imagination, when anticipating how they will feel in the future. Thus, people should remember their emotional response to past events more accurately than they forecast their emotional response to future events. However, the more important an event is, the more likely it will be accompanied by vivid mental representations. Since past events are typically viewed as less important than future events, people may judge their forecasts to be more vivid and more accurate than their memories. Similarly, people may be less accurate at forecasting their emotional response to important outcomes than unimportant ones. This is because they fail to anticipate how much they will accommodate to important outcomes and how much they will regulate their emotional response (Wilson & Gilbert, 2008). But because forecasts about important outcomes are so vivid, people may perceive them to be more accurate than they actually are. The vividness of affective forecasts may also help to explain what makes them so motivating. Compared to unimportant outcomes, affective forecasts about important outcomes are likely to be more vivid, more intense, and perceived to be more accurate. An unexplored

issue is which of these characteristics best accounts for the greater effort people put in to attain important goals.

The Present Investigation

Researchers agree that the key function of affective forecasts is to motivate efforts to attain or avoid future outcomes (e.g., Mellers et al., 1999; Miloyan & Suddendorf, 2015). The two main goals of this research were to investigate how accurately people forecast and remember their emotion responses to an event and how forecast emotion motivates behavior. To investigate these questions, participants were told they might be chosen to complete a paid online survey. They reported their forecast emotional response (evening of day 1), experienced emotional response (evening of day 2), and remembered emotional response (evening of day 3) to not being chosen to complete the paid online survey. Using a single event, with equal time intervals between emotion reports, allowed us to directly compare the accuracy and phenomenological vividness of forecast and remembered emotion. The importance of the outcome was varied by manipulating the amount of money participants would have received had they been chosen to complete the paid survey. This permitted us to explore the effect of event importance on the vividness, intensity, and accuracy of mental representations of emotion. It also allowed us to assess whether vividness, intensity, or accuracy mediated the relationship between importance and behavior.

In summary, we expect emotion forecasts and the vividness of mental representations to be more compelling for events that are judged to be more important. Since events are typically less important in retrospect than they are when they are still a future possibility, we hypothesize that, across all participants, people will judge emotion forecasts to be more accurate than memories. We anticipate that, in contrast, remembered emotion will actually be more accurate

than forecast emotion. Based on the prior reviewed research, we further hypothesize that manipulating the importance of an event will reveal several important relationships. Compared to a low importance event, we expect that, (a) people will exert more effort to achieve and positive and avoid a negative outcome for a high importance event, (b) emotion forecasts will be more intense, more vivid, and perceived to be more accurate for a high importance event. Finally, we hypothesize that the intensity of emotion forecasts and the vividness of future-directed emotional representations may mediate the relationship between experimental condition (high vs. low importance event) and the effort people expend to achieve a positive outcome and to avoid a negative outcome.

Method

Participants

Data collection was planned for approximately 400 participants based on estimates that this sample size would be sufficient to detect small effect sizes. The estimates were derived from g*power computations showing that 272 participants were needed to obtain a power of .95 to detect an effect size of .20 for the difference between two dependent means, and that 220 participants were needed to obtain a power of .95 to detect an effect size of .10 for a mixed model analysis of variance with two groups and eight repeated measures. We oversampled due to anticipated attrition over time. We recruited participants from undergraduate social science courses at a large public California university. Participants were compensated for their participation with course credit. From an initial group of 408 participants, we excluded 39 participants who did not complete all three surveys, 26 participants who expressed suspicion that deception was used, and 5 participants who declined to allow their data to be analyzed by researchers after debriefing. In the final sample (N = 338), 82% were women, and the average

age was 20.70 years (*SD* = 2.67, *range* 18-50 years).[1] Participants reported their ethnicity as East/Southeast Asian (42%), Hispanic (29%), White (14%), South Asian (3%), or African American (2%), with remaining participants indicating other ethnic backgrounds (10%).

Design and Procedure

We adapted a scenario in which participants experience rejection. Participants were informed that a local business was working together with the researchers to prescreen participants for participation in a brief, paid online survey the next day. To qualify, participants provided written answers to 10 questions. Participants were told that their answers would be evaluated by representatives of the business the following day, and that they will be rejected only if the evaluators ware unanimous in their decision that the applicant is unfit for the paid study. Participants were randomly assigned to a condition which manipulates the importance of being chosen (or not chosen) by assigning different compensation levels to the paid study. In prior research, similar manipulations have produced medium to large effect sizes in ratings of the strength of forecast emotion (Gilbert et al., 1998, Study 6; Lench et al., 2019, Study 4).

This study used a three-part longitudinal design with one between subject condition: importance. Participants completed online surveys on three consecutive mid-week evenings. The surveys assessed their forecast (Time 1), experienced (Time 2), and remembered (Time 3) emotional response to not being chosen by a local business to complete a paid survey for $5 (low importance) or $100 (high importance).

Time 1: Forecast emotion. In the first survey, participants were informed that the researchers were working in collaboration with a local business which was seeking students to evaluate advertisements for one of their new services. Participants were told that, if chosen for this opportunity, they would be paid to complete a brief (about 5 minutes) online survey the

following evening, right after completing the second questionnaire for this study. Participants in the high importance condition were told that they will be paid $100 if they were chosen and completed the paid survey. Payment of $5 was offered in the low importance condition. Participants were then told that they would undergo a screening procedure to determine their suitability for the paid session. Further, they were informed that they would answer questions about their emotional response to the paid study opportunity as part of the collaboration.

Importance. Participants then rated, "How important is it to you whether you are chosen for the paid task?" 1 *(not at all important)* to 9 *(extremely important*).

Emotion forecasts. All participants then forecast how they would feel if they were chosen, and if they were not chosen, to take the paid survey. Specifically, they forecast how intensely happy and unhappy they would feel during the 10 minutes after they learned whether they were [chosen / not chosen]: "When you click on the link to complete our second survey tomorrow evening, you'll find out whether the business chose you to evaluate ads for [$100 / $5] pay. Then you'll spend 10 minutes answering some questions about consumer products for our study. Imagine you are [chosen / not chosen] to evaluate ads for pay. During the ten minutes after you find out, how will you feel about [being chosen / not being chosen] to evaluate ads for [$100 / $5] pay? How intensely will you feel? [happy / unhappy]" 1 *(not at all)* to 9 *(extremely*).

Vividness and perceived accuracy of forecasts. Participants then rated the phenomenological vividness (i.e., intensity, sense of experiencing, ease, and detail) and perceived accuracy of their emotion forecasts concerning being chosen, and to not being chosen, for the paid survey: "We asked you to imagine that you are [chosen / not chosen] to evaluate ads for [$100 / $5] pay:"

a) *Present emotion:* "Regardless of how you expect to feel in the future, how intensely did you experience emotion when you were imagining [being chosen / not being chosen] for the paid study?" 1 *(I felt detached and not emotional)* to 9 *(I felt intensely emotional*).

b) *Experiencing*: "When you were imagining your reaction, how much did you feel like you were actually experiencing the event?" 1 *(it did not feel like I was experiencing it)* to 9 *(it felt just like I was actually experiencing it*).

c) *Ease:* "How easy was it for you to imagine your reaction?" 1 *(it was very hard to imagine my reaction)* to 9 *(it was very easy to imagine my reaction*).

d) *Detail:* "In how much detail did you imagine your reaction to this event?" 1 *(vague with no or few details)* to 9 *(vivid and highly detailed*).

e) Perceived accuracy: "How accurately do you think you predicted how you will feel?" 1 *(not at all accurately)* to 9 *(extremely accurately).*

Prescreen behavioral task. Finally, participants completed the 10 prescreen questions. They were advised to write no more than a few sentences in answer to any one question. They were then reminded that their answers would be evaluated by business representatives on the following day. Appendix A contains the instructions to participants for the prescreen task and question text.

Time 2: Experienced emotion. The next evening, we sent participants a link to the second survey. They were asked to enter their name so that the system could retrieve the business representatives' decision. After a 10 second delay to simulate the time needed for the system to retrieve the decision notice, participants were informed that they had not been chosen for the paid survey. They then completed a 10 minute, affectively neutral, filler task that required minimal attention. This slow-paced, neutral filler task was designed to give participants time to

experience an emotional response to being rejected from the opportunity to earn money. Adapted from a procedure developed by Hembacher & Ghetti (2017), participants viewed pictures of common products (e.g., toaster, garden hose). After viewing each image, they indicated whether consumers typically use the product inside or outside the house, by pressing one of two keys on a keyboard. Participants rated one image every 15 seconds over the 10-minute period, for a total of 40 images.

Afterwards, participant rated how important is was to them whether they were chosen for the paid task. They also rated the intensity of happiness and unhappiness they experienced during the ten minutes after being rejected. These questions were the same as at Time 1 except that the wording was altered to indicate present tense.

Time 3: Remembered emotion. The evening after learning that they were rejected for the paid study, participants received an emailed link to the final survey. They rated how important is was whether they were chosen for the paid task. Then participants were asked to remember the intensity of happiness and unhappiness they felt during the 10 minutes after they found out they were not chosen for the paid study. These questions were the same as at Time 1, with the wording altered to indicate past tense.

Vividness and perceived accuracy of memories. Participants then rated the phenomenological vividness of their memories (i.e., intensity, sense of experiencing, ease, and detail), and the perceived accuracy of their memories, using the same questions as at Time 1.

Debriefing. Finally, participants read a debriefing document informing them that all participants were rejected for the paid survey, that there were no business representatives evaluating their responses, and that this was done to create an emotionally meaningful event for participants. Participants were then given an option to withhold their data from analysis by the

researchers. To be sure that all participants received the debriefing, we also sent a copy of the debriefing to all participants via e-mail immediately after the Time 3 survey response window closed. The manipulation may bring financial concerns to mind for some students, so we also presented information about campus counseling, financial, and food insecurity services during the debriefing.

Analyses

Emotion composites. Consistent with past studies, and in the interest of parsimony, we created composite measures of emotion by subtracting unhappiness ratings from happiness ratings (e.g., Kahneman & Krueger, 2006). Higher values indicate greater happiness. We created four separate composite measures of emotion: forecast emotion for being chosen, forecast emotion for not being chosen, experienced emotion, and remembered emotion.

Vividness composites. Participants' ratings of the vividness of forecast emotion (present emotion, experiencing, ease, detail) were moderately to strongly correlated, so we averaged these ratings to create a vividness index for forecasts concerning being chosen, $\alpha = .84$, and not being chosen, $\alpha = .78$. We also created vividness index for remembered emotion, $\alpha = .70$.

Assessing the inaccuracy of forecasts and memories. We assessed the inaccuracy of emotion forecasts and memories in two ways. First, we examined the direction of bias subtracting experienced emotion from forecast emotion, and by subtracting experienced emotion from remembered emotion. Values greater than zero indicate overestimation, values less than zero indicate underestimation. If some people overestimate their emotional experience and others underestimate, average measures of the direction of memory bias mask overall inaccuracy. Therefore, we also assessed overall inaccuracy by computing the absolute value of the difference between experienced and forecast emotion, and between experienced and remembered emotion.

Results

Importance

To evaluate the efficacy of the importance manipulation, and assess whether importance changed over time, we conducted a mixed model ANOVA on participants' ratings of the importance of being chosen. Condition (low importance, high importance) was the between subjects variable and time (Time 1: forecast, Time 2: experience, Time 3: memory) was the within subjects variable. As shown in Figure 3.1, there was a main effect of condition, $F(1, 336) = 27.63$, $MSE = 304.16$, $p < .001$, $\eta^2_p = .08$, such that participants viewed being chosen for the paid survey as more important in the high importance condition ($100 opportunity) than in the low importance condition ($5 opportunity). Thus, the experimental manipulation was effective. In addition, importance decreased over time, $F(2, 672) = 54.00$, $MSE = 105.60$, $p < .001$, $\eta^2_p = .14$. No interaction between time and condition was found, $F(2, 672) = 0.06$, $p = .94$. Paired t-tests (with 95% CI for the difference between means) revealed that participants viewed being chosen as more important when it was a future possibility than right after learning they were not chosen, $t_{T1 \text{ vs. } T2}(337) = 5.01$, $p < .001$, $d = .25$, 95% CI [0.36, 0.83], or on the following day, $t_{T1 \text{ vs. } T3}(337) = 9.71$, $p < .001$, $d = .50$, 95% CI [0.89, 1.34]. They also rated being chosen as more important just after learning they were not chosen than on the following day, $t_{T2 \text{ vs. } T3}(337) = 6.15$, $p < .001$, $d = .23$, 95% CI [0.36, 0.69].

Inaccuracy of Forecast and Remembered Emotion

Direction of bias. All participants were informed that they had not been chosen to complete the paid survey, so analyses of accuracy focused on forecast and remembered emotional responses to not being chosen. Table 3.1 shows the mean intensity of emotion concerning not being chosen that participants forecast, experienced, and remembered by

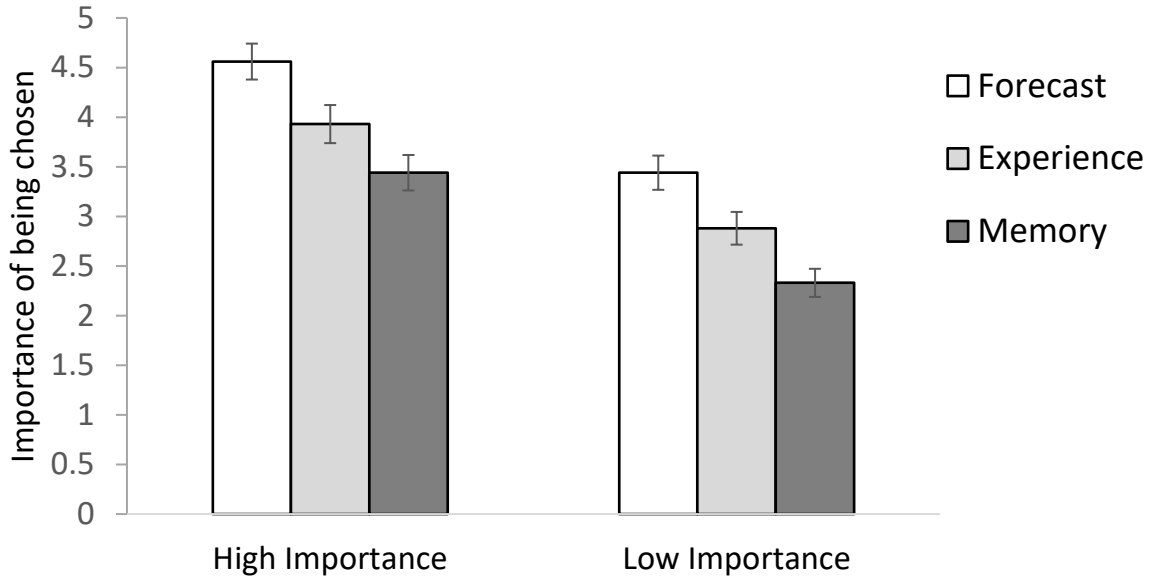


Figure 3.1. Rated importance of being chosen for the paid study at forecast, experience, and memory, presented for all participants and by experimental condition. Higher values indicate greater importance. Error bars represent +/−1 standard error.

condition. To find out whether participants over- or underestimated in forecasting or remembering their feelings, we conducted a mixed model ANOVA on bias in forecasting and remembering emotional intensity. As a reminder, bias was calculated by subtracting experienced emotion from forecast emotion, and by subtracting experienced emotion from remembered emotion. Judgment (forecast, memory) was the within subjects variable and condition (low importance, high importance) was the between subjects variable. The model was not significant, $F(1, 329) = 2.43$, $MSE = 42.13$, $p = .12$, indicating no significant over- or underestimation.

Overall inaccuracy. Averaging the direction of bias across participants masks the magnitude of inaccuracy if some people overestimate and others underestimate. Therefore, we conducted the same ANOVA to assess the overall inaccuracy of forecast and remembered

Table 3.1. *Mean Forecast, Experienced, and Remembered Intensity of Happiness for not being Chosen for All Participants and by Experimental Condition (N = 338)*

	Forecast		*Experienced*		Remembered	
Group	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
High importance	-0.80	(3.98)	-0.10	(3.21)	-0.58	(3.19)
Low importance	0.65	(3.28)	0.50	(2.87)	0.34	(2.53)

emotion, independent of direction of bias. Results showed main effects of judgment, $F(1, 329) = 61.51$, $MSE = 259.79$, $p < .001$, $\eta^2_p = .16$, and importance condition, $F(1, 329) = 8.86$, $MSE = 73.32$, $p = .003$, $\eta^2_p = .03$, but no interaction, $p = .23$. As Figure 3.2 shows, forecasts were less accurate than memories. In addition, forecasts about an important outcome were less accurate ($M = 3.42$, $SD = 3.10$) than forecasts about an unimportant outcome ($M = 2.63$, $SD = 2.66$), $t(332) = 2.50$, $p = .01$, $d = .27$, 95% CI [0.17, 1.41]. Although the same trend was found for memory, remembered feelings about an important outcome were not significantly more inaccurate ($M = 1.97$, $SD = 2.44$) than remembered feelings about an unimportant outcome ($M = 1.56$, $SD = 1.76$), $t(332) = 1.81$, $p = .07$, $d = .19$, 95% CI [-0.04, 0.87]. In summary, participants' forecasts were less accurate than their memories. Forecasts were less accurate when the stakes were high than when the stakes were low.

Perceived Accuracy and Vividness of Forecast and Remembered Emotion

Next we assessed how good participants were at judging the accuracy of their forecasts. Given that forecasts were less accurate than memories, did participants correctly perceive their forecasts to be less accurate? We conducted a mixed model ANOVA on the perceived accuracy

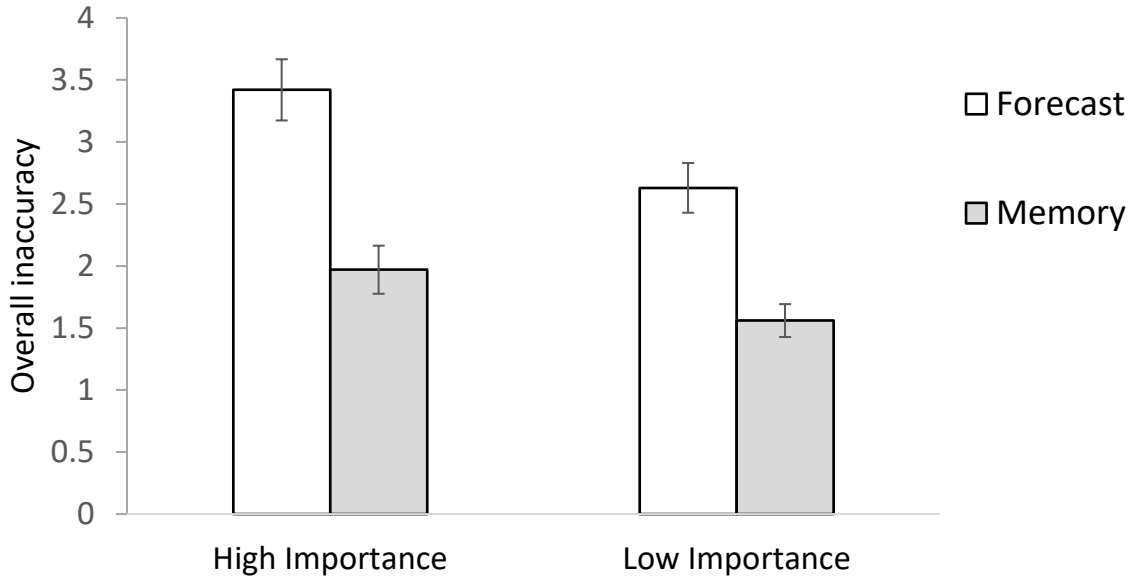


Figure 3.2. Overall inaccuracy of forecast and remembered feelings about not being chosen for a paid study by importance condition. Overall inaccuracy refers to the absolute value of the difference between forecast and experienced happiness. Higher values indicate more inaccuracy. Error bars represent +/−1 standard error.

of forecasts and memories, with importance condition as the between subjects variable. The results showed only a main effect of judgment, $F(1, 336) = 30.80$, $MSE = 86.62$, $p < .001$, $\eta^2_p = .08$. Despite the fact that forecasts were less accurate than memories, participants perceived their forecasts ($M = 6.29$, $SD = 1.99$) to be more accurate than their memories ($M = 5.56$, $SD = 2.24$). Perceived accuracy did not differ by importance condition ($p = .73$).

We conducted the same ANOVA on the vividness of forecasts and memories. The results showed main effects of judgment, $F(1, 335) = 16.28$, $MSE = 21.68$, $p < .001$, $\eta^2_p = .05$, and condition, $F(1, 335) = 9.11$, $MSE = 39.74$, $p = .003$, $\eta^2_p = .03$. Participants perceived forecasts ($M = 4.65$, $SD = 1.73$) to be more vivid than memories ($M = 4.29$, $SD = 1.67$). In addition, forecast

and remembered emotion were more vivid when they concerned an important outcome than an unimportant outcome (Forecasts: M_{high} = 4.94, M_{low} = 4.39; Memories: M_{high} = 4.52, M_{low} = 4.09).

To find out whether participants perceived vivid forecasts and memories to be more accurate, we conducted three separate regression analyses on the perceived accuracy of: (1) participants' forecast emotional response to being chosen for the paid task, (2) participants' forecast emotional response to not being chosen, and (3) participants' remembered emotional response to not being chosen. The predictors were vividness, importance condition, and their interaction. Each model was significant: forecasts for being chosen, R^2 = .20, F(3, 334) = 27.97, MSE = 74.96, p < .001, forecasts for *not* being chosen, R^2 = .14, F(3, 334) = 17.83, MSE = 61.72, p < .001, memory, R^2 = .28, F(3, 333) = 42.85, MSE = 155.83, p < .001. Vividness predicted perceived accuracy in all three models: forecasts for being chosen, b = 0.46, SE = .05, t(334) = 9.09, p < .001, 95% CI [0.36, 0.56], forecasts for *not* being chosen, b = 0.43, SE = .06, t(334) = 7.18, p < .001, 95% CI [0.31, 0.54], memory, b = 0.71, SE = .06, t(333) = 11.28, p < .001, 95% CI [0.58, 0.83]. Importance condition and the interaction of vividness and importance condition were not significant predictors of perceived accuracy (all ps > .09). Thus, the more vivid forecasts and memories were, the more accurate participants perceived them to be.

Although participants were assigned to high and low importance conditions, they varied in how important the possibility of earning $5 or $100 was for them. Therefore, we conducted a regression analysis to find out whether participants' ratings of importance predicted how well-calibrated they were when judging the accuracy of forecast emotion. The dependent variable was the perceived accuracy of forecasts about not being chosen. The predictors were overall inaccuracy, importance ratings, and their interaction. The model was significant, R^2 = .02, F(3,

330) = 2.72, *MSE* = 10.78, *p* = .04. Perceived accuracy was predicted by overall inaccuracy, *b* = -.16, *SE* = .08, *t*(330) = -2.08, *p* = .04, and by the interaction of importance ratings and overall inaccuracy, *b* = .04, *SE* = .01, *t*(330) = 2.78, *p* = .006. This interaction is depicted in Figure 3.3, which shows that participants had insight into the accuracy of their forecasts when they viewed the importance of the outcome as low. That is, the more accurate their forecasts were, the more accurate they perceived them to be. In contrast, when participants viewed the outcome as highly important, the less accurate their forecasts were, the more accurate they perceived them to be. The same model predicting the perceived accuracy of memory was not significant.

In summary, these findings reveal that people are poor at judging the accuracy of their affective forecasts, particularly when the stakes are perceived to be high. Memories were more accurate than forecasts but participants perceived their forecasts to be more accurate and more vivid than their memories. Moreover, participants forecast their emotional response to an unimportant outcome more accurately than an important outcome. Yet, across conditions, the more important participants rated the outcome, the more accurate they perceived their forecasts to be.

Affective Forecasts and Behavior

The intensity of emotion people forecast, and the vividness and perceived accuracy of their forecasts, are consequential to the extent that they motivate behavior. Therefore, we next examined how forecasts were related to the amount of time participants spent answering the ten prescreen questions. The distribution of time spent answering the ten prescreen questions (*M* = 7.49, *SD* = 5.91, range = 0.06 to 51.31 minutes) was approximately lognormal and highly skewed. Consistent with other studies featuring lognormal variables, we computed and analyzed the log of time spent, which was more compliant with distribution assumptions (Kahneman &

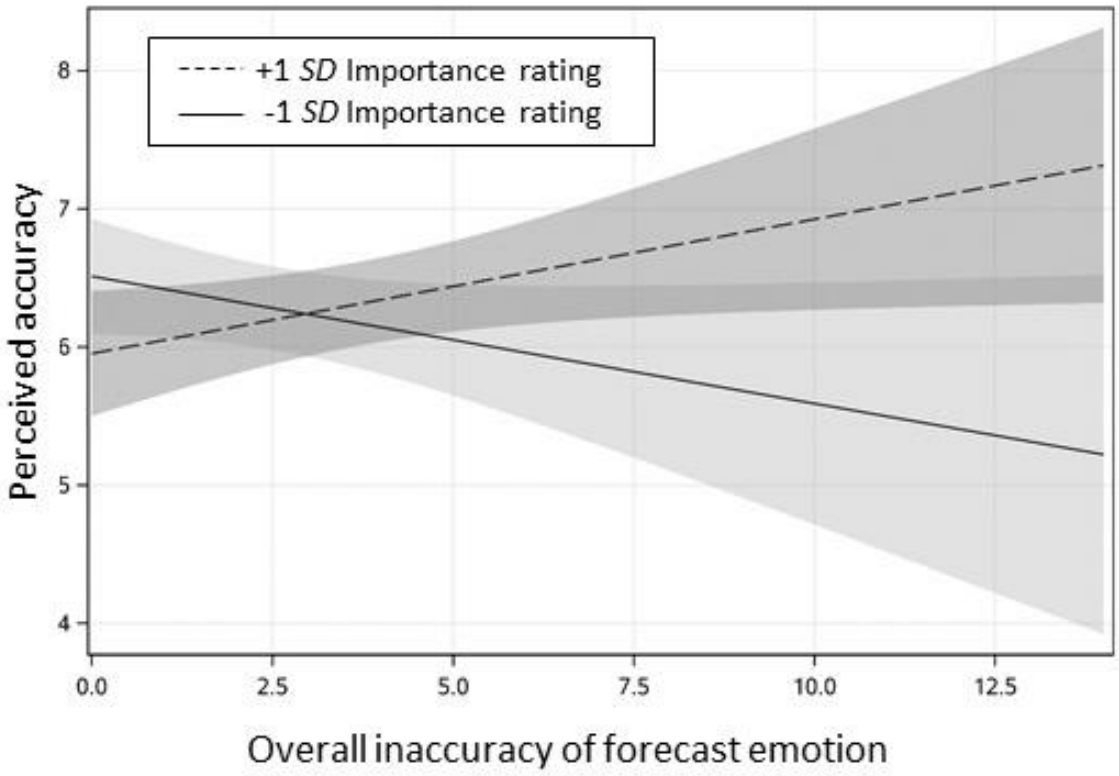


Figure 3.3. For outcomes rated as low in importance, the more inaccurate participants' forecasts were, the more inaccurate they perceived them to be. In contrast, for outcomes rated as highly important, the more inaccurate participants' forecasts were, the more accurate they perceived them to be.

Deaton, 2010; Oishi, Kesebir & Diener, 2011; Richards, 2010).

Importance of outcomes and accuracy of forecasts. Overall, participants spent more time answering the prescreen questions in the high importance condition (M = 8.52, SD = 6.75) than in the low importance condition (M = 6.57, SD = 4.87), $t(336) = 3.13$, $p = .002$, $d = .34$, 95% CI [0.10, 0.44]. In addition, across conditions, the more important participants rated being chosen, the more time they spent completing the prescreen questions, $r(338) = .12$, p = .03. The

accuracy of forecasts (direction of bias, overall inaccuracy) was not related to time spent on prescreen questions (*p*s > .31).

Intensity, vividness, and perceived accuracy of forecasts. Next we assessed whether the intensity, vividness, or perceived accuracy of participants' forecasts about important and unimportant outcomes predicted the time participants spent answering the prescreen questions. We conducted two separate regression analyses to find out if time spent was predicted by participants' forecast emotional response to: (1) being chosen for the paid survey, and (2) not being chosen. In both analyses, the predictors were the intensity of emotion participants forecast, the vividness of forecasts, the perceived accuracy of forecasts, importance condition, and the interactions between importance condition and intensity, vividness, and perceived accuracy.

The first model, which included forecasts for being chosen, was significant, R^2 = .09, F(7, 322) = 4.35, MSE = 2.70, p < .001. The intensity of emotion forecast, b = 0.04, SE = .02, t(322) = 2.20, p = .03, 95% CI [0.004, 0.007], and the vividness of forecasts, b = 0.06, SE = .03, t(322) = 2.17, p = .03, 95% CI [0.006, 0.119], predicted time spent. In contrast, perceived accuracy did not predict time spent, p = .72. There was also an interaction between intensity of emotion forecast and importance condition, b = 0.07, SE = .04, t(322) = 2.02, p = .04, 95% CI [0.002, 0.147]. Participants spent more time answering the prescreen questions in the high importance condition compared to the low importance condition. The more intense participants' emotional forecasts were, the greater the difference in time spent between the high and low importance conditions.

The second model, which included forecasts for *not* being chosen, was also significant, R^2 = .08, F(7, 326) = 4.19, MSE = 2.60, p < .001. The more vivid forecasts were, the more time participants spent answering the prescreen questions, b = 0.08, SE = .03, t(326) = 3.01, p = .003,

95% CI [0.03, 0.14]. No other significant effects were found (*p*s > .08).

In summary, participants in the high importance condition spent more time answering the prescreen questions than did participants in the low importance condition. In addition, more vivid forecasts predicted time spent. Forecasting more intense emotion also predicted time spent, but only when participants contemplated being chosen. Finally, an interaction between importance and intensity indicated that the more intense emotion participants forecast feeling if they were chosen, the greater the difference in time spent between the high and low importance conditions. Perceived accuracy did not predict time spent.

Mediation Analysis

Why did participants spend more time answering the prescreen questions in the high importance condition than in the low importance condition? To find out, we conducted a multiple mediation analysis using Preacher and Hayes (2008) bootstrapping method (model 4) with 5000 samples per test. Specifically, we assessed whether the vividness or the intensity of forecasts for being chosen accounted for the association between importance and time spent answering prescreen questions (Hayes, 2017). As Figure 3.4 shows, the vividness of forecasts predicted time spent when controlling for intensity of forecast emotion, b = .07, SE = .03, 95% CI [.02, .12], $t(328) = 2.76$, p = .006 (path b_1). In contrast, the intensity of forecast emotion was no longer related to time spent when vividness was controlled for, b = .03, SE = .02, 95% CI [-.004, .065], $t(328) = 1.72$, p = .09 (path b_2). With both mediators included in the model, the direct effect of importance condition on time spent (path c') was no longer significant, indicating that vividness of forecasts fully mediated the relationship, b = .16, SE = .09, 95% CI [-.03, .34], $t(328) = 1.69$, p = .09. This suggests that the vividness of forecasts plays a crucial role, above and beyond their intensity, in motivating goal-directed action.

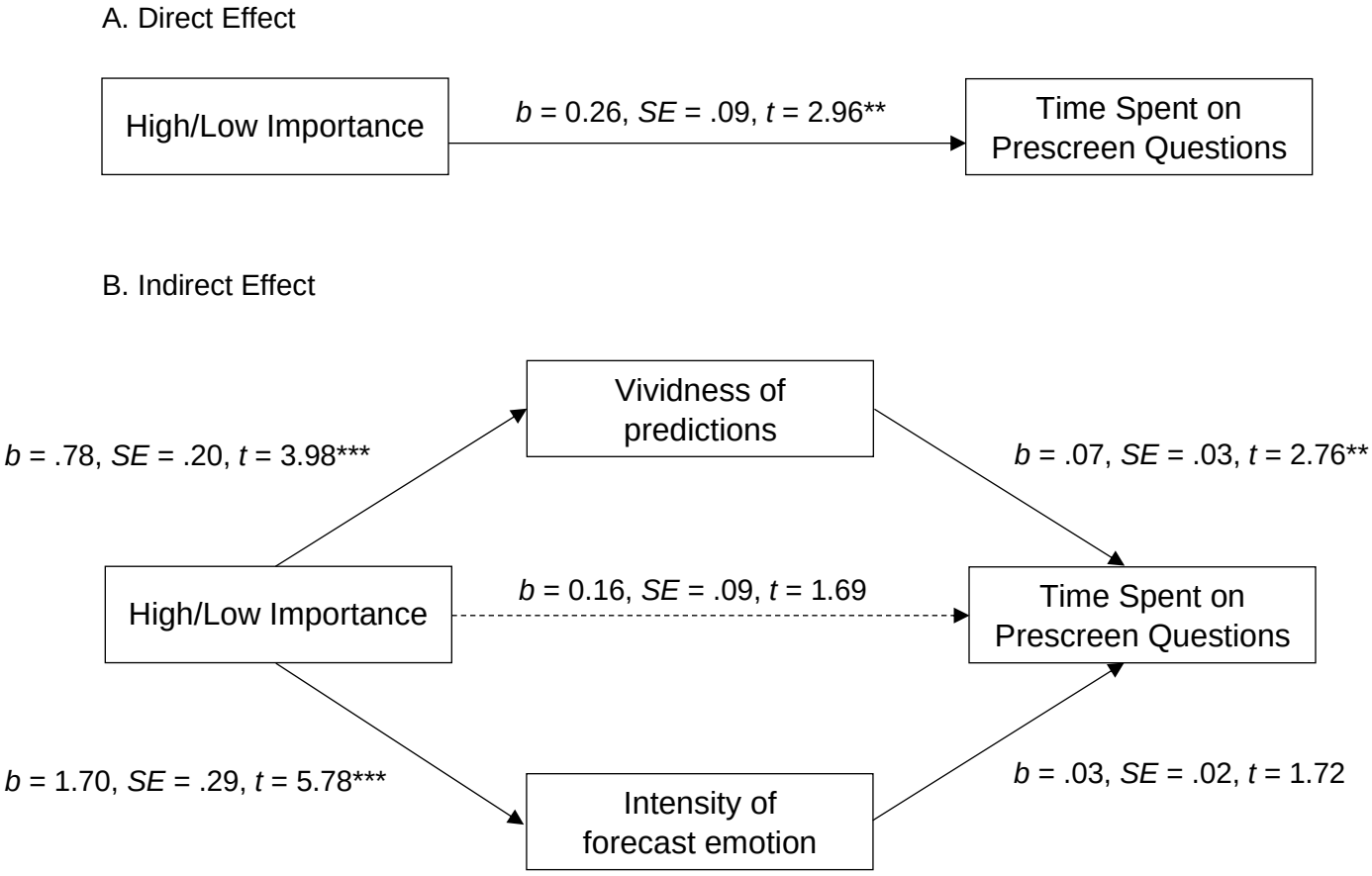


Figure 3.4. Path analysis of mediation effects. The vividness, rather than intensity, of forecast emotion concerning being chosen for the paid study explained the association between the importance of the outcome and the amount of time participants spent completing the prescreen questions, *Adj*. R^2 = .07***; Mediated effect = .10, *SE* = .04, 95% CI [.04, .19]. Unstandardized coefficients are presented. **p < .01, ***p < .001.

Discussion

Human beings demonstrate an impressive ability to engage in mental time travel. One moment we are reminiscing about the past, treasuring a poignant memory. Then we draw on the details of past experiences to simulate how an important future event might unfold. Our

representations of past and future emotion help us to decide on a course of action by signaling how closely potential outcomes align with our goals and interests (Miloyan & Suddendorf, 2015). In addition to being informative, forecasts and memories are vivid experiences in the present. The vividness of present experience can motivate us to follow through on our plans. Recent studies suggest that affective forecasts are more compelling than remembered emotion (Levine et al., 2020). We extended this research by exploring a possible explanation for this finding: that future events perceived to be important promote more extreme and more vivid forecasts. We also investigated whether cognitive judgments about anticipated emotion (the intensity of emotion people expect to experience in the future), the immediate experience of making that cognitive judgment (vividness of forecasts), or both mediated the relationship between importance of an outcome and time spent completing a task. This was the first study to experimentally manipulate the importance of an event in a controlled setting to reveal how event importance, and the vividness and intensity of mental representations, are related to goal-directed action.

Overall, memories were more accurate than forecasts, but forecasts were more compelling – they were perceived to be more accurate and vivid than memories. The greater accuracy of memories than forecasts may be understood by considering differences between prospection and retrospection. Memory for past events is aided by the availability of episodic details about that event. The uncertainty of future events leads people to rely more heavily on semantic knowledge and appraisals. Lacking episodic details about a future event, people must base their forecasts on past experiences judged to be similar to the anticipated outcome (Kane et al., 2012; Levine et al., 2020). Thus, the availability of episodic details promotes accuracy for

past feelings, while the uncertainty surrounding future events promotes inaccuracy in forecasts about future feelings.

If forecasts were less accurate, why did people perceive them to be more accurate and vivid than their memories? Events that people perceive to be important for attaining their goals evoke stronger emotions and more vivid mental images (Cole & Berntsen, 2016). Participants viewed future events as more important than past events. This may be because people can act on and change future events. In contrast, past events can no longer be changed so people accommodate to them and regulate their emotional response (Van Boven & Caruso, 2015). Manipulating the importance of the outcome supported the role of event importance as an explanation for the paradoxical relation between the lower accuracy and greater vividness of affective forecasts. Participants' affective forecasts about an important outcome, the opportunity to earn $100, were more vivid but less accurate than their affective forecasts about an unimportant outcome, the opportunity to earn $5. Across importance conditions, the more important it was to participants to be chosen, the less accurate their emotion forecasts were yet the more accurate they perceived them to be. Thus, affective forecasts about important future events are imbued with what Late Show host, Steven Colbert referred to as "truthiness" – the feeling that something is true despite evidence to the contrary.

Although forecasts can be inaccurate, researchers have surmised that they are functional because they motivate goal-directed action (Miloyan & Suddendorf, 2015; Morewedge & Buechel, 2013). The current investigation provides evidence in support of this view and further shows the characteristics of forecasts that predict effort. Participants in the high importance condition spent more time on the prescreen questions than did participants in the lower importance condition. Moreover, a multiple mediation model showed that the vividness of

forecasts, rather than their intensity, explained the relationship between event importance and effort. That is, participants spent more time answering questions for the opportunity to earn $100 than $5. Participants forecast that they would feel more intense happiness if they were chosen to earn $100 than $5. Forecasts about being chosen to earn $100 were also more vivid. When both the intensity and vividness of forecast emotion were entered as mediators of the relationship between outcome importance and time spent, the vividness of forecasts fully explained participants' tendency to spend more time answering questions for the opportunity to earn $100 than $5. After adjusting for vividness, participants' cognitive judgment about the intensity of emotion they would feel in the future did not predict their behavior. In addition, neither the actual accuracy nor the perceived accuracy of forecasts was related to behavior. These findings suggest that the present vividness of forecasts motivates goal-directed behavior.

Limitations and Future Directions

The present investigation manipulated event importance to aid understanding of why forecasts are so compelling and how they motivate behavior. The use of a standardized event enabled a more precise measure of the role of importance than would be obtained if the severity of the event differed across participants. Matching the time intervals between reports of forecast and experienced emotion, and reports of remembered and experienced emotion, allowed us to directly compare the vividness and accuracy of forecasts and memories. However, the study has limitations. All participants experienced a negative outcome. It would be useful to extend this investigation to positive events. It would also be useful to extend it to naturally occurring events outside of a laboratory or survey setting. The fact that several key findings mirror those found in a prior study (Levine et al., 2020) bodes well for the generalizability of the results.

Conclusions

In summary, asymmetries between mental representations of past and future emotion help explain why affective forecasts are so compelling and motivating. A key difference between forecasts and memories is that forecasts are perceived to be more important and more vivid. Moreover, vivid mental representations serve as a powerful cue, leading people to perceive their emotion forecasts to be more accurate. Yet vividness was also associated with less accurate forecasts, particularly for highly important events. If accurate forecasts enable people to most effectively identify and pursue goals that contribute to their happiness, what benefit does vividness confer? The vividness of forecasts, the immediate, emotion-infused experience evoked by anticipating the future, motivates behavior. The results showed that vividness of forecasts, and not the cognitive judgment about their future intensity, mediated the relationship between importance condition and the amount of time participants spent completing prescreen questions. More important events evoke more vivid forecasts, and these in turn increase the effort people expend to achieve their goals.

Footnotes

[1]The main group of participants (N = 338) rated forecast, remembered, and experienced emotion. To find out if rating forecast emotion influenced subsequent ratings of experienced or remembered emotion, an additional subgroup of participants (n = 97) completed the surveys only for experienced and remembered emotion. Appendix B outlines the procedure for each group of participants by condition. *T*-tests comparing measures between the two groups (experienced emotion, remembered emotion, accuracy of remembered emotion, perceived accuracy of memory, remembered vividness, and importance of the outcome) showed no significant differences (all *p*s > .10). Thus, rating forecast emotion did not appear to affect subsequent ratings.

CHAPTER 5:

Conclusions

Affective forecasts and memory for emotion play an important role in how people make decisions and may influence personal happiness and well-being. People try to remember how they felt in the past to forecast how they will feel in similar situations in the future. When forecasts are inaccurate, people may pursue goals or allocate resources in a way that fails to maximize their well-being. My dissertation investigated several previously unanswered research questions. I asked whether aspirational sources of identity – religious belief systems – inform people's beliefs about how they should feel in the future. I further investigated whether self-enhancement mediated the link between religiosity and well-being (Chapter 2). To advance our understanding of the quality of human decision making, I assessed the features of forecast emotion people rely on to make important life decisions. I then evaluated whether the features people relied on more were also the features they forecast more accurately (Chapter 3). I investigated whether perceptions of accuracy align with the actual accuracy of forecast and remembered emotion and how the importance of an event, and forecast emotional intensity and vividness, are related to goal-directed behavior. (Chapter 4). Together, these research projects shed light on how people's social identity shapes the emotional experiences they anticipate, why there are disparities between the actual and perceived accuracy of forecasts and memories, and how people use forecasts to motivate decisions and actions that they expect to maximize their future happiness and well-being.

The two studies presented in Chapter 2 demonstrated that people who were more religious forecast they would feel happier receiving a lower exam grade than expected. However, even when religion was made salient just before participants reported their experienced emotion,

more religious participants did not experience more happiness. More religious participants also reported greater satisfaction with life. These findings indicate that religiosity was associated with greater well-being and more happiness when judgments were abstract (life satisfaction) or temporally distant (forecast emotion), but not for a judgment that was for a specific, temporally close event (experience). Chapter 2 also demonstrated that the association between religiosity and life satisfaction was fully mediated by self-enhancement, indicating that an elevated self-view contributes to the relationship between religiosity and greater subjective well-being. Together, these findings suggest an additional pathway from religiosity to well-being, that the greater subjective well-being reported by more religious people stems in part from beliefs about how they want to or expect to feel, rather than how they actually feel after a negative outcome. This finding advances our understanding of the circumstances under which religion contributes to well-being and coping.

Chapter 3 is the first examination of which features of their emotional experience people try to forecast in order to make important life decisions. In two studies, people based their decision more on forecasts of how intensely happy they expected to feel than on forecasts of how frequently they would feel happy or how long their happy mood would last. The importance of emotion intensity for global evaluations of past experience may help explain why people rely more on intensity forecasts for their decisions. To forecast how they will feel in the future, people try to remember how they felt in similar past circumstances (Shepperd et al., 2000). Thus, people may forecast emotional intensity to maximize their future happiness and well-being because this feature of emotion is particularly memorable and is weighted heavily in judgments of the overall value of past experiences (Fredrickson, 2000). Chapter 3 also demonstrated that people were highly accurate when forecasting the intensity of their emotions. In contrast, they

overestimated how frequently they would feel happy about their match and how long their happiness would last. Moreover, accurate intensity forecasts were related to being matched to a more favored residency program and to later satisfaction with that program. Overall, then, the findings of Chapter 3 suggest that emotion forecasts serve as more effective guides to decision making that was previously believed.

Despite the greater accuracy of forecasts of emotional intensity than frequency or duration, the future is uncertain, and people do make errors in predicting how they will feel. They sometime overestimate their emotional response and they sometimes underestimate. The results of Chapter 4 showed that people are poor at judging the accuracy of their emotion forecasts. Participants were not selected for a chance to earn either $5 or $100. Participants' memories of their emotional reaction to that loss were more accurate than their forecasts. Nevertheless, they perceived their forecasts to be more accurate and vivid than their memories. Further, the more important the chance to earn money was for participants, the less accurately they forecast their emotional response, but the more accurate they perceived their forecasts to be. Events that are temporally imminent, changeable, and important tend to evoke vivid mental representations (Cole & Berntsen, 2016), and people appear to mistake this vividness for accuracy.

Even when inaccurate, affective forecasts are thought to be functional because they motivate people to strive to achieve their goals. We examined whether the *intensity* of forecast emotion (people's cognitive judgment about how a future event will make them feel) or the *vividness* of forecast emotion (people's present experience when making that judgment) predicted goal-directed action. The amount of time people spent answering screening questions indicated that, not surprisingly, they put more effort into attaining a chance to earn $100 than $5.

Their current experience of the vividness of forecast emotion fully accounted for this greater goal-directed effort, even controlling for their cognitive judgment of how intensely happy they would feel if they were chosen for the opportunity to earn money. This finding points to a critical role that the current experience of forecasts plays for motivating behavior.

In conclusion, Chapter 2 showed that the social groups that people identify strongly with appear to influence the emotions people expect to feel, and their reported satisfaction with life, even when it does not influence how people actually feel in the immediate wake of negative events. Chapter 3 demonstrated that, though affective forecasts can be mistaken, people are better at forecasting the intensity of their future emotional response than its frequency or duration. Moreover, they rely on these more accurate forecasts to make decisions, and reliance on intensity predicts positive career outcomes. This suggests that emotions are a better guide to decision making than much of the affective forecasting literature suggests. Chapter 4 showed that people are not good at judging the accuracy of their forecasts because they are so vivid but this vividness motivates them to strive to achieve their goals..

References

Alicke, M. D. (1985). Global self-evaluation as determined by the desirability and controllability of trait adjectives. *Journal of Personality and Social Psychology, 49*, 1621-1630. doi:10.1371/journal.pone.0047103

Ano, G. G., & Vasconcelles, E. B. (2005). Religious coping and psychological adjustment to stress: A meta-analysis. *Journal of Clinical Psychology, 61*, 461-480. doi:10.1002/jclp.20049

Ariely, D., & Loewenstein, G. (2000). When does duration matter in judgment and decision making? *Journal of Experimental Psychology: General, 129*, 508. doi:10.1037/0096-3445.129.4.508

Ayton, P., Pott, A., & Elwakili, N. (2007). Affective forecasting: Why can't people predict their emotions?. *Thinking & Reasoning, 13*, 62-80. doi:10.1080/13546780600872726

Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1997). Deciding advantageously before knowing the advantageous strategy. *Science, 275*, 1293-1295. doi:10.1126/science.275.5304.1293

Bell, B. E., & Loftus, E. F. (1985). Vivid persuasion in the courtroom. *Journal of Personality Assessment, 49*, 659-664. doi:10.1207/s15327752jpa4906_16

Benjamin, A. S., Bjork, R. A., & Schwartz, B. L. (1998). The mismeasure of memory: When retrieval fluency is misleading as a metamnemonic index. *Journal of Experimental Psychology: General, 127*, 55-68. doi:10.1037/0096-3445.127.1.55

Berntsen, D., & Bohn, A. (2010). Remembering and forecasting: The relation between autobiographical memory and episodic future thinking. *Memory and Cognition*, *38*, 265-

278. doi:10.3758/mc.38.3.265

Blondé, J., & Girandola, F. (2016). Revealing the elusive effects of vividness: A meta-analysis of empirical evidences assessing the effect of vividness on persuasion. *Social Influence, 11*, 111-129. doi:10.1080/15534510.2016.1157096

Carlson, S. J., Levine, L. J., Lench, H. C., Flynn, E., Carpenter, Z. K., Perez, K. A., & Bench, S. W. (in press). You Shall go forth with joy: Religion and aspirational judgments about emotion. *Psychology of Religion and Spirituality*.

Cole, S. N., & Berntsen, D. (2016). Do future thoughts reflect personal goals? Current concerns and mental time travel into the past and future. *The Quarterly Journal of Experimental Psychology, 69*, 273-284. doi:10.1080/15534510.2016.1157096

Colvin, C. R., Block, J., & Funder, D. C. (1995). Overly positive self-evaluations and personality: Negative implications for mental health. *Journal of Personality and Social Psychology*, *68*, 1152. doi:10.1037/0022-3514.68.6.1152

Curtin, L. S., & Signer, M. M. (2017). Ensuring the integrity of the national resident matching program. *Journal of the American Medical Association, 318*(23), 2289-2290. doi:10.1001/jama.2017.16269

D'Argembeau, A., Renaud, O., & Van der Linden, M. (2011). Frequency, characteristics and functions of future-oriented thoughts in daily life. *Applied Cognitive Psychology, 25*, 96-103. doi:10.1002/acp.1647

DeWall, C. N., Baumeister, R. F., Chester, D. S., & Bushman, B. J. (2016). How often does currently felt emotion predict social behavior and judgment? A meta-analytic test of two theories. *Emotion Review, 8*, 136-143. doi:10.1177/1754073915572690

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life

scale. *Journal of Personality Assessment*, *49*, 71-75. doi:10.1207/s15327752jpa4901_13

Diener E., Sandvik E., & Pavot W. (2009). Happiness is the frequency, not the intensity, of positive versus negative affect. In: E. Diener (Ed.), *Assessing Well-Being. Social Indicators Research Series*, Vol 39. Dordrecht: Springer.

Diener, E., Tay, L., & Myers, D. G. (2011). The religion paradox: If religion makes people happy, why are so many dropping out? *Journal of Personality and Social Psychology*, *101*, 1278-1290. doi:10.1037/a0024402

Ditlevsen, S., Christensen, U., Lynch, J., Damsgaard, M. T., & Keiding, N. (2005). The mediation proportion: A structural equation approach for estimating the proportion of exposure effect on outcome explained by an intermediate variable. *Epidemiology, 16,* 114-120. doi:10.1097/01.ede.0000147107.76079.07

Doré, B. P., Meksin, R., Mather, M., Hirst, W., & Ochsner, K. N. (2016). Highly accurate prediction of emotions surrounding the attacks of September 11, 2001 over 1-, 2-, and 7-year prediction intervals. *Journal of Experimental Psychology: General*, *145*, 788. doi:10.1037/xge0000168

Dorison, C. A., Minson, J. A., & Rogers, T. (2019). Selective exposure partly relies on faulty affective forecasts. *Cognition, 188*, 98-107. doi:10.1016/j.cognition.2019.02.010

Dunning, D., Meyerowitz, J. A., & Holzberg, A. D. (1989). Ambiguity and self-evaluation: The role of idiosyncratic trait definitions in self-serving assessments of ability. *Journal of Personality and Social Psychology, 57*, 1082. doi:10.1037/0022-3514.57.6.1082

Dyrbye, L. N., West, C. P., Satele, D., Boone, S., Tan, L., Sloan, J., & Shanafelt, T. D. (2014). Burnout among US medical students, residents, and early career physicians relative to the general US population. *Academic Medicine*, *89*, 443-451. doi:10.1097/

acm.0000000000000134

Edwards, W. (1961). Behavioral decision theory. *Annual Review of Psychology, 12*, 473-498.

Ferriss, A. L. (2002). Religion and the quality of life. *Journal of Happiness Studies, 3*, 199-215. doi:10.1023/A:1020684404438

Fredrickson, B. L. (2000). Extracting meaning from past affective experiences: The importance of peaks, ends, and specific emotions. *Cognition & Emotion, 14*, 577-606. doi:10.1080/026999300402808

Frijda, N. H., Ortony, A., Sonnemans, J., & Clore, G. L. (1992). The complexity of intensity: Issues concerning the structure of emotion intensity. In M. S. Clark (Ed.), *Review of personality and social psychology, No. 13. Emotion* (p. 60–89). Sage Publications, Inc.

Gebauer, J. E., Sedikides, C., & Schrade, A. (2017). Christian self-enhancement. *Journal of Personality and Social Psychology, 113*, 786-809. doi:10.1037/pspp0000140

Gilbert, D. T., Driver-Linn, E., & Wilson, T. D. (2002). The trouble with Vronsky: Impact bias in the forecasting of future affective states. In: L. F. Barrett & P. Salovey (Eds.), *Emotions and Social Behavior. The wisdom in feeling: Psychological processes in emotional intelligence* (pp. 114-143). New York, NY: The Guilford Press.

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatley, T. P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 75*, 617. doi:10.1037/0022-3514.75

Green, M., & Elliott, M. (2010). Religion, health, and psychological well-being. *Journal of Religion and Health, 49*, 149-163. doi:10.1007/s10943-009-9242-1

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Hembacher, E., & Ghetti, S. (2017). Subjective experience guides betting decisions beyond accuracy: Evidence from a metamemory illusion. *Memory, 25,* 575-585. doi:10.1080/09658211.2016.1197946

Hoerger, M., Scherer, L. D., & Fagerlin, A. (2016). Affective forecasting and medication decision making in breast-cancer prevention. *Health Psychology, 35,* 594. doi:10.1037/hea0000324

Holy Qur'an. (A.Y. Ali, Trans. & T. Griffith, Eds.). (2001). Wordsworth.

Kahneman, D., & Deaton, A. (2010). High income improves evaluation of life but not emotional well-being. *Proceedings of the National Academy of Sciences, 107,* 16489-16493. doi:10.1073/pnas.1011492107

Kahneman, D., Fredrickson, B. L., Schreiber, C. A., & Redelmeier, D. A. (1993). When more pain is preferred to less: Adding a better end. *Psychological Science, 4,* 401-405. doi:10.1111/j.1467-9280.1993.tb00589.x

Kahneman, D., & Krueger, A. B. (2006). Development in the measurement of subjective well-being. *The Journal of Economic Perspectives*, 20, 3-24. doi:10.1257/089533006776526030

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. A. (2006). Would you be happier if you were richer? A focusing illusion. *Science, 312,* 1908-1910. doi: 10.1126/science.1129688

Kane, J., Van Boven, L., & McGraw, A. P. (2012). Prototypical prospection: Future events are more prototypically represented and simulated than past events. *European Journal of Social Psychology, 42,* 354-362. doi:10.1002/ejsp.1866

Kaplan, R. L., Levine, L. J., Lench, H. C., & Safer, M. A. (2016). Forgetting feelings: Opposite

biases in reports of the intensity of past emotion and mood. *Emotion, 16,* 309-319. doi:10.1037/emo0000127

Kelley, C. M., & Jacoby, L. L. (1990). The construction of subjective experience: Memory attributions. *Mind & Language*, *5,* 49-68. doi:10.1111/j.1468-0017.1990.tb00152.x

Kim-Prieto, C., & Diener, E. (2009). Religion as a source of variation in the experience of positive and negative emotions. *The Journal of Positive Psychology, 4,* 447-460. doi:10.1080/17439760903271025

Lehner, E., & D'Argembeau, A. (2016). The role of personal goals in autonoetic experience when imagining future events. *Consciousness and Cognition, 42,* 267-276. doi:10.1016/j.concog.2016.04.002

Lench, H. C., Levine, L. J., Perez, K., Carpenter, Z. K., Carlson, S. J., Bench, S. W., & Wan, Y. (2019). When and why people misestimate future feelings: Identifying strengths and weaknesses in affective forecasting. *Journal of Personality and Social Psychology*. doi:10.1037/pspa0000143

Leondari, A., & Gialamas, V. (2009). Religiosity and psychological well-being. *International Journal of Psychology*, *44,* 241-248. doi:10.1080/00207590701700529

Levine, L. J. (1997). Reconstructing memory for emotions. *Journal of Experimental Psychology: General*, *126*, 165-177. doi:10.1037/0096-3445

Levine, L. J., & Edelstein, R. S. (2009). Emotion and memory narrowing: A review and goal-relevance approach. *Cognition and Emotion, 23,* 833–875. doi:10.1080/02699930902738863

Levine, L. J., Lench, H. C., Kaplan, R. L., & Safer, M. A. (2012). Accuracy and artifact: Reexamining the intensity bias in affective forecasting. *Journal of Personality and Social*

Psychology, 103, 584-605. doi:10.1037/a0029544

Levine, L. J., Lench, H. C., Kaplan, R. L., & Safer, M. A. (2013). Like Schrödinger's cat, the impact bias is both dead and alive: Reply to Wilson and Gilbert (2013). *Journal of Personality and Social Psychology, 105,* 749–756. doi:10.1037/a0034340

Levine, L. J., Lench, H. C., Karnaze, M. M., & Carlson, S. J. (2018). Bias in predicted and remembered emotion. *Current Opinion in Behavioral Sciences, 19,* 73-77. doi:10.1016/j.cobeha.2017.10.008

Levine, L. J., Lench, H. C., Stark, C. E., Carlson, S. J., Carpenter, Z., Perez, K. A., Stark, S., & Frithsen, A. (2020). Predicted and remembered emotion: Tomorrow's vividness trumps yesterday's accuracy. *Memory, 28,* 128-140. doi:10.1080/09658211.2019.1693598

Levine, L. J., Murphy, G., Lench, H. C., Greene, C. M., Loftus, E. F., Tinti, C., ... & Stark, C. E. (2021). Remembering facts versus feelings in the wake of political events. *Cognition and Emotion,* 1-20. https://doi.org/10.1080/02699931.2021.1910496

Loewenstein, G., & Lerner, J. S. (2003). The role of affect in decision making.

Mata, A., Simão, C., Farias, A. R., & Steimer, A. (2019). Forecasting the duration of emotions: A motivational account and self-other differences. *Emotion, 19,* 503-519. doi:10.1037/emo0000455

McAdams, D. P., & Olson, B. D. (2010). Personality development: Continuity and change over the life course. *Annual Reviews, 61,* 517–542. doi:10.1016/j.jrp.2006.11.005

Mellers, B. A., & McGraw, A. P. (2001). Anticipated emotions as guides to choice. *Current Directions in Psychological Science, 10,* 210-214. doi:10.1111/1467-8721.00151

Mellers, B. A., Schwartz, A., Ho, K., & Ritov, I. (1997). Decision affect theory: Emotional reactions to the outcomes of risky options. *Psychological Science, 8,* 423-429.

doi:10.1111/j.1467-9280.1997.tb00455.x

Mellers, B., Schwartz A., & Ritov, I. (1999). Emotion-based choice. *Journal of Experimental Psychology: General, 128,* 332-345. doi:10.1037/0096-3445.128.3.332

Miloyan, B., & Suddendorf, T. (2015). Feelings of the future. *Trends in Cognitive Sciences, 19,* 196-200. doi:10.1016/j.tics.2015.01.008

Morewedge, C. K., & Buechel, E. C. (2013). Motivated underpinnings of the impact bias in affective forecasts. *Emotion, 13,* 1023. doi:10.1037/a0033797

Morewedge, C. K., Gilbert, D. T., & Wilson, T. D. (2005). The least likely of times: How remembering the past biases forecasts of the future. *Psychological Science*, *16,* 626-630. doi:10.1111/j.1467-9280.2005.01585.x

Newman, D. B., Schwarz, N., Graham, J., & Stone, A. A. (2018). Conservatives report greater meaning in life than liberals. *Social Psychological and Personality Science*, *10,* 494-503. doi:10.1177/1948550618768241

Oishi, S., Kesebir, S., & Diener, E. (2011). Income inequality and happiness. *Psychological Science*, *22*, 1095-1100. doi:10.1177/0956797611417262

Ong, D. C., Goodman, N. D., & Zaki, J. (2018). Happier than thou? A self-enhancement bias in emotion attribution. *Emotion*, *18*, 116-126. doi:10.1037/emo0000309

Özbek, M., Bohn, A., & Berntsen, D. (2016). Imagining the personal past: Episodic counterfactuals compared to episodic memories and episodic future projections. *Memory & Cognition, 45,* 375–389. doi:10.3758/s13421-016-0671-2

Parappully, J., Rosenbaum, R., Van Den Daele, L., Nzewi, E. (2002). Thriving after trauma: The experience of parents of murdered children. *Journal of Humanistic Psychology, 42*, 33-70. doi:10.1177/0022167802421003

Paulhus, D. L. (1988). Balanced inventory of desirable responding (BIDR). *Acceptance and Commitment Therapy. Measures Package, 41,* 79586-7.

Paulhus, D. L. (1994). *Balanced inventory of desirable responding: Reference manual for BIDR version 6*. Unpublished manuscript, University of British Columbia, Vancouver, Canada.

Perry, L. M., Hoerger, M., Korotkin, B. D., & Duberstein, P. R. (2020). Perceived importance of affective forecasting in cancer treatment decision making. *Journal of Psychosocial Oncology*. doi:10.1080/07347332.2020.1768198

Pollner, M. (1989). Divine relations, social relations, and well-being. *Journal of Health and Social Behavior, 30,* 92-104. doi:10.2307/2136915

Powell, L. H., Shahabi, L., & Thoresen, C. E. (2003). Religion and spirituality: Linkages to physical health. *American Psychologist*, *58*, 36–52. doi:10.1037/0003-066X.58.1.36

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40,* 879-891. doi:10.3758/BRM.40.3.879

Richards, J. E. (2010). The development of attention to simple and complex visual stimuli in infants: Behavioral and psychophysiological measures. *Developmental Review, 30,* 203-219. doi:10.1016/j.dr.2010.03.005

Robinson, M. D., & Clore, G. L. (2002). Episodic and semantic knowledge in emotional self-report. *Journal of Personality and Social Psychology, 83,* 198-215. doi:10.1037//0022-3514.83.1.198

Rubin, D. C. (2014). Schema-driven construction of future autobiographical traumatic events: the future is much more troubling than the past. *Journal of Experimental Psychology: General*, *143*, 612. doi:10.1037/a0032638

Salsman, J. M., Brown, T. L., Brechting, E. H., & Carlson, C. R. (2005). The link between religion and spirituality and psychological adjustment: The mediating role of optimism and social support. *Personality and Social Psychology Bulletin, 31*, 522-535. doi:10.1177/0146167204271563

Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B: Biological Sciences, 362*, 773-786. doi:10.1098/rstb.2007.2087

Schacter, D. L., Addis, D. R., & Buckner, R. L. (2008). Episodic simulation of future events: Concepts, data, and applications. *Annals of the New York Academy of Sciences, 1124*, 39-60. doi:10.1196/annals.1440.001

Sedikides, C., & Gebauer, J. E. (2010). Religiosity as self-enhancement: A meta-analysis of the relation between socially desirable responding and religiosity. *Personality and Social Psychology Review, 14*, 17-36. doi:10.1177/1088868309351002

Seligman, M. E., Railton, P., Baumeister, R. F., & Sripada, C. (2013). Navigating into the future or driven by the past. *Perspectives on Psychological Science, 8*, 119-141. doi:10.1177/1745691612474317

Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2016). Religious priming: A meta-analysis with a focus on prosociality. *Personality and Social Psychology Review, 20*, 27-48. doi:10.1177/1088868314568811

Shepperd, J. A., Findley-Klein, C., Kwavnick, K. D., Walker, D., & Perez, S. (2000). Bracing for loss. *Journal of Personality and Social Psychology, 78*, 620. doi:10.1037/0022-3514.78.4.620

Shepperd, J. A., Ouellette, J. A., & Fernandez, J. K. (1996). Abandoning unrealistic optimism:

Performance estimates and the temporal proximity of self-relevant feedback. *Journal of Personality and Social* Psychology, 70, 844. doi:10.1037/0022-3514.70.4.844

Smith, D., Loewenstein, G., Jepson, C., Jankovich, A., Feldman, H., & Ubel, P. (2008). Mispredicting and misremembering: Patients with renal failure overestimate improvements in quality of life after a kidney transplant. *Health Psychology, 27,* 653. doi:10.1037/a0012647

Spilka, B., Shaver, P., & Kirkpatrick, L. A. (1985). A general attribution theory for the psychology of religion. *Journal for the Scientific Study of Religion,* 1-20. doi:10.2307/1386272

Stöber, J., Dette, D. E., & Musch, J. (2002). Comparing continuous and dichotomous scoring of the Balanced Inventory of Desirable Responding. *Journal of Personality Assessment*, *78*, 370-389. doi:10.1207/S15327752JPA7802_10

Stock, W. A., Okun, M. A., & Benin, M. (1986). Structure of subjective well-being among the elderly. *Psychology and Aging, 1*, 91-102. doi:10.1037//0882-7974.1.2.91

Szpunar, K. K. (2010). Episodic future thought: An emerging concept. *Perspectives on Psychological Science*, 5, 142–162. doi:10.1177/ 1745691610362350

Taylor, S. E., & Brown, J. D. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, *103*, 193-210. doi:10.1037/ 0033-2909.103.2.193

The Holy Bible, New International Version. (2011). Blue Letter Bible. https://www.blueletterbible.org/niv/index. Cfm (Original work published 1973).

Tsai, J. L. (2007). Ideal affect: Cultural causes and behavioral consequences. *Perspectives on Psychological Science, 2,* 242-259. doi:10.1111/j.1745-6916.2007.00043.x

Tsai, J. L., Miao, F. F., & Seppala, E. (2007). Good feelings in Christianity and Buddhism: Religious differences in ideal affect. *Personality and Social Psychology Bulletin, 33,* 409-421. doi:10.1177/0146167206296107

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science, 185,* 1124-1131. doi:10.1126/science.185.4157.1124

Van Boven, L., & Ashworth, L. (2007). Looking forward, looking back: Anticipation is more evocative than retrospection. *Journal of Experimental Psychology: General, 136,* 289-300. doi:10.1037/0096-3445.136.2.289

Van Boven, L., & Caruso, E. M. (2015). The tripartite foundations of temporal psychological distance: Metaphors, ecology, and teleology. *Social and Personality Psychology Compass, 9,* 593–605. doi:10.1111/spc3.12207

Van Boven, L., Kane, J., & McGraw, A. P. (2009). Temporally asymmetric constraints on mental simulation: Retrospection is more constrained than prospection. *Handbook of Imagination and Mental Simulation,* 131-147.

Van Cappellen, P., Toth-Gauthier, M., Saroglou, V., & Fredrickson, B. L. (2016). Religion and well-being: The mediating role of positive emotions. *Journal of Happiness Studies, 17,* 485-505. doi:10.1007/s10902-014-9605-5

VanderWeele, T. J. (2017). Religious communities and human flourishing. *Current Directions in Psychological Science*, *26*, 476-481. doi:10.1177/0963721417721526

Vishkin, A., Ben-Nun Bloom, P., Schwartz, S. H., Solak, N., & Tamir M. (2019). Religiosity and emotion regulation. *Journal of Cross-Cultural Psychology, 50,* 1050-1074. doi:10.1177/0022022119880341

Vishkin, A., Schwartz, S. H., Ben-Nun Bloom, P., Solak, N., & Tamir, M. (2020). Religiosity

and desired emotions: Belief maintenance or prosocial facilitation? *Personality and Social Psychology Bulletin, 46,* 1090-1106. doi:10.1177/0146167219895140

Wilson, T. D., & Gilbert, D. T. (2003). Affective forecasting. *Advances in Experimental Social Psychology*, *35*, 345-411. doi:10.1016/S0065-2601(03)01006-2

Wilson, T. D., & Gilbert, D. T. (2008). Explaining way: A model of affective adaptation. *Perspectives on Psychological Science, 3,* 370– 386. doi:10.1111/ j.1745-6924.2008.00085.x

Wilson, T. D., Wheatley, T., Meyers, J. M., Gilbert, D. T., & Axsom, D. (2000). Focalism: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 78,* 821. doi:10.1037/0022-3514.78.5.821

Winkielman, P., Schwarz, N., & Belli, R. F. (1998). The role of ease of retrieval and attribution in memory judgments: Judging your memory as worse despite recalling more events. *Psychological Science, 9,* 124-126. doi:10.1111/1467-9280.00022

Wirtz, D., Kruger, J., Scollon, C. N., & Diener, E. (2003). What to do on spring break? The role of predicted, on-line, and remembered experience in future choice. *Psychological Science, 14*, 520-524. doi:10.1111/1467-9280.03455

Witter, R. A., Stock, W. A., Okun, M. A., & Haring, M. J. (1985). Religion and subjective well-being in adulthood: A quantitative synthesis. *Review of Religious Research*, *26*, 332-342. doi:10.2307/3511048

Wojcik, S. P., Hovasapian, A., Graham, J., Motyl, M., & Ditto, P. H. (2015). Conservatives report, but liberals display, greater happiness. *Science, 347,* 1243-1246. doi:10.1126/science.1260817

Ysseldyk, R., Matheson, K., & Anisman, H. (2010). Religiosity as identity: Toward an

understanding of religion from a social identity perspective. *Personality and Social Psychology Review, 14*, 60-71. doi:10.1177/1088868309349693

APPENDIX A

Prescreen Prompt and Questions

The questions below were selected to give the business representatives an idea of how you think and make decisions. Take about 10 minutes to respond to the questions. Your answers should be short (about 2-4 sentences for each question).

1. Why did you select your major?
2. What factors influence your decision to take a particular class?
3. How do you most frequently communicate with friends?
4. What are the benefits to attending your university?
5. What are the drawbacks to attending your university?
6. If you had to pick your most important characteristic, what would it be?
7. What would your friends consider to be your most important characteristic?
8. How do you select a place to eat lunch?
9. Where do you get information about current events?
10. How do you get information about products when you're considering a purchase?

APPENDIX B

Study Design: Ratings to be Completed by Each Group of Participants

		Time		
	Importance condition	Day 1: Forecast	Day 2: experience rejection	Day 3: Memory
Main group: Rates forecast, experienced, and remembered emotion	High	Forecasts emotional response to rejection and acceptance	Rates experienced emotional response to rejection	Remember emotional response to rejection
	Low	Forecasts emotional response to rejection and acceptance	Rates experienced emotional response to rejection	Remember emotional response to rejection
Subgroup: Rates experienced and remembered emotion only	High	No rating of forecast emotion	Rates experienced emotional response to rejection	Remember emotional response to rejection