

# CHAPTER 1

General Introduction and  
Dissertation Outline

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*What, then, is time? If no one asks me, I know; if I want to explain it to a questioner, I do not know. But at any rate this much I dare affirm I know: that if nothing passed, there would be no past time; if nothing were approaching, there would be no future time; if nothing were, there would be no present time.*

- Saint Augustine, *Confessions, Book XI, Chapter XIV*

Time is omnipresent in human life. Humans talk about time, all the time: in the Corpus of Contemporary American English, which is about 560 million words in size, *time* comes up 908,345 times, making it the most frequent noun in the entire corpus (Davies, 2008). Humans think about time, all the time: studies on mind-wandering show humans very frequently think about future events (Song & Wang, 2012; Spronken, Holland, Figner, & Dijksterhuis, 2016; Stawarczyk, Cassol, & D'Argembeau, 2013). Humans tweet about time, all the time: a recent study showed that more than half of all tweets during a four-month period in America were about either the past or the future (Thorstad & Wolff, 2016). And lastly, humans read and learn about time, all the time: books on time management, like for example *When: The Scientific Secrets of Perfect Timing* (Pink, 2018) or *The 4-Hour Workweek* (Ferriss, 2009), feature in best-selling lists and can be readily found in most book stores. Yet, the concept of time is still elusive, as is attested to by Saint Augustine in the above quote as well. Consequently, many scientists, from various disciplines, have studied time in an attempt to come to somewhat of an understanding about what it actually is.

## THE SCIENTIFIC INQUIRY INTO TIME

Time as a concept has been a subject of scientific inquiry that has transcended the boundaries of different scientific fields and methodologies. Each of these scientific fields has contributed to the understanding of time in different ways. In physics, Einstein's world famous theory of relativity has taught us that time (and space) is relative (Redd, 2017). In philosophy, McTaggart (1908) proved that time is, in fact, unreal. Namely, the two ways through which time materializes and orders temporal events – the A- and B-series, where the relation or status of temporal events are either construed as *past*, *present*, and *future*, or *earlier* and *later*, respectively – are either atemporal because they do not allow for change (the B-series) or are contradictory in nature (the A-series; Garrett, 2006; McTaggart, 1908). In biology, the inquiry into time, specifically into the internal clock of the *Drosophila melanogaster*, a.k.a. the fruit fly, has provided us with insight into the genetic basis of the body's internal clock, which is essential for all somatic functioning and sense of duration (Bargiello, Jackson, & Young,

1984; Sehgal et al., 1995). In sociology, time has been studied in relation to society, with the work of Rosa (2013) and Giddens (1990; see also Sullivan, Keefer, Stewart, & Palitsky, 2016) both showing how societal changes are co-dependent on the changing role of time (and space) in society. In anthropology, the work of Hall (1959, 1966, 1983) has shown us that societies differ in how life is organized, with some societies keeping monochronic time and other societies keeping polychronic time. With monochronic time, the duration of events is often determined by the clock, people tend to focus on doing one thing at the time, and promptness is valued; with polychronic time, the duration of events is often determined by the event itself, people tend to do multiple things at the same time, and relationships are valued over promptness (Hall, 1959, 1966, 1983).

Time has also been extensively studied by psychologists who have provided insights into how time shapes daily lives, emotions, thoughts, and interactions with others. In Construal Level Theory (Liberman & Trope, 1998; Trope & Liberman, 2010), an influential theory within social psychology, time has been shown to affect whether people perceive something either abstractly or concretely, and that this will consequently affect how they think, feel, and act in the present (Rim, Uleman, & Trope, 2009; Wakslak, Liberman, & Trope, 2007). Zimbardo and Boyd's (1999, 2008) eminent work on future orientation has shown how people differ from one another in terms of their temporal orientation. Temporal orientation is consequential as it underlies self-control and affects such things as academic engagement (Horstmannshof & Zimitat, 2007), risk-taking and health behavior (Keough, Zimbardo, & Boyd, 1999; Rothspan & Read, 1996; Zimbardo, Keough, & Boyd, 1997), financial security (Webley & Nyhus, 2005), and environmental friendly attitudes (Milfont & Gouveia, 2006). Levine's (2006) cross-cultural work on time has shown how cultures differ in terms of their pace of life and how these differences can not only lead to funny misunderstandings between people but also affect people's health, wealth, and happiness. Psychologists have also shown the role time plays in shaping identity; namely, identity, is in part, comprised of our future selves, the ideas we have about who we will become (Markus & Nurius, 1986). Future selves also play a vital role in shaping our behavior and decision-making (Ersner-Hershfield, Wimmer, & Knutson, 2009; Hershfield, Cohen, & Thompson, 2012; Pronin, Olivola, & Kennedy, 2008; Strauss, Griffin, & Parker, 2012; van Gelder, Hershfield, & Nordgren, 2013).

## THE COGNITIVE REPRESENTATION OF TIME

Another aspect related to time that has been given ample attention by researchers and psychologists in particular, is the cognitive representation of time. According to embodied theories of cognition, our conceptual knowledge is, in fact, grounded in the mental simulation of sensory, motor, and introspective states (Barsalou, Niedenthal, Barbey, & Ruppert, 2003). Evidence from studies using neuroimaging as well as behavioral studies has been accumulating in support for these theories (Beauchamp, Lee, Haxby, & Martin, 2002; Chao & Martin, 2000; Pecher, Zeelenberg, & Barsalou, 2004; Simmons, Martin, & Barsalou, 2005; Wu & Barsalou, 2009), showing, for example, that when processing an action word like *lick* or *kick* the same areas in the motor cortex of the brain are activated as when we actually move our tongue and leg, respectively (Hauk, Johnsrude, & Pulvermüller, 2004). However, if conceptual knowledge consists of multi-modal simulations, how are abstract concepts, like time, which cannot be experienced directly through the senses, represented? Insights from linguistics, but also anthropology and cognitive psychology, have provided an answer to this question. Namely, when talking about time, humans, across the globe, tend to rely on spatial terms and will, for example, say *the meeting was very long, leaving sad days behind*, and *the deadline is approaching*. This is also evident in the way Saint Augustine, quoted above, describes time: events need to *pass by* for there to be past time and events need to be *approaching* for there to be a future time. Consequently, it has been posited that abstract concepts like time, are understood via more concrete concepts, like space. This is formalized within Conceptual Metaphor Theory (Lakoff & Johnson, 1980) and has been, *inter alia*, corroborated by psychological experimentation that shows that temporal judgments are affected by spatial cues (Casasanto & Boroditsky, 2008) and that spatial movement (actual or imagined) affects time representation (Boroditsky & Ramscar, 2002; Matlock, Ramscar, & Boroditsky, 2005; Miles, Karpinska, Lumsden, & Macrae, 2010). Comparable findings are, for example, reported for the abstract concept of morality and the concrete concept of cleanliness (Liljenquist, Zhong, & Galinsky, 2010; Zhong & Liljenquist, 2006), as well as for the abstract concept of loneliness and the concrete concept of coldness (IJzerman et al., 2012; Zhong & Leonardelli, 2008).

Seeing how both time and space are multifaceted, there is not one way in which space is used to represent time, rather numerous different metaphors, or spatializations of time, are used to think and talk about time (Bender & Beller, 2014; Núñez & Cooperrider, 2013). For example, when looking at layouts of calendars across the world, we may see the days of the week laid out either from left-to-right, from right-to-left, or from top-to-bottom. And research indeed confirms that time can be thought about horizontally, vertically, as flowing from left-to-right, or from right-to-left (Boroditsky,

Fuhrman, & McCormick, 2011; Casasanto & Bottini, 2014; Fuhrman & Boroditsky, 2010; Santiago, Lupiáñez, Pérez, & Funes, 2007; Tversky, Kugelmass, & Winter, 1991). Additionally, when comparing the following two expressions, *I am approaching the deadline vs. the deadline is approaching me*, it becomes apparent that in the first expression the passing of time is conceptualized by having the person move along an imaginary time line (often referred to as the ego-moving representation) whereas in the other expression, the passing of time is conceptualized by having a temporal event move along a timeline towards the person (often referred to as the time-moving representation; Gentner & Imai, 1992; Lakoff & Johnson, 1980; McGlone & Harding, 1998). Two research areas, which have largely operated independently of one another, have blossomed around these different spatializations of time.

The first area of research working on the different spatializations of time has been mainly focused on cataloguing the different spatializations (see, for example, Bender & Beller, 2014). A major impetus in the area, rooted in anthropology, linguistics, and cognitive psychology, comes from cross-cultural work, which shows that different cultures vary greatly in which spatializations of time they use. For example, where some cultures generally think of future events as being located to the front (of the body) and past events to the back (of the body), attested to by expressions such as *leaving bad days behind*, and *a bright future ahead*, other cultures represent future events to the back and past events to the front (de la Fuente, Santiago, Roman, Dumitrache, & Casasanto, 2014; Li, Bui, & Cao, 2018). Another cultural variant can be observed amongst the Pormpuraaw: instead of relying on a deictic axis, the Pormpuraaw make use of the absolute east-to-west axis to order temporal events, with earlier events being to the east of later events (Boroditsky & Gaby, 2010; Gaby, 2012). A major achievement of this research area has not only been to catalogue the different representations, but also to show how factors that vary cross-culturally, like temporal orientation, language, and spatial cognition, shape the way different cultures think about time.

The second research area working on the different spatializations of time takes a social and personality psychological approach and has been focused on investigating the psychological reality of these spatializations. Interestingly, research in this area has almost exclusively used English speaking samples (using American or British participants) and has focused on two spatializations of time in particular: the ego-moving representation and the time-moving representation. This research area has shown that these two different representations of time are not merely linguistic artifacts but indeed are psychologically meaningful: stable personality traits, for example conscientiousness or extroversion, as well as context-dependent factors, such as emotion valence, current emotions, or spatial cues in the environment, all

affect which spatialization of time is used (Boroditsky, 2000; Boroditsky & Ramscar, 2002; Duffy & Feist, 2014; Duffy, Feist, & McCarthy, 2014; Hauser, Carter, & Meier, 2009; Margolies & Crawford, 2008; McGlone & Harding, 1998; McGlone & Pfiester, 2009; Richmond, Wilson, & Zinken, 2012).

Both research areas dedicated to studying the spatializations of time have contributed to our understanding of time in different ways. Perhaps because of the different scientific approaches and methodologies in which they are rooted, there is, however, a paucity of integrative work. Even though, in combining the approaches and insights, several unexplored issues become apparent. For example, is the interaction between culture, cognition, and behavior similarly viewed by both research areas? Also, to what extent can the spatializations of time be considered as cultural or individual difference variables or are they more situated as some of the research linking them to situational factors suggests? Furthermore, are cultural factors related to different representations in the same way that personality factors seem to be related to different spatializations of time and do they perhaps underlie and/or perpetuate certain cultural differences? And lastly, do the found relations between certain spatializations of time and personality or situational factors found within the social psychological and personality literature generalize across different cultures/languages or are they culturally specific? This dissertation aims at answering these unexplored questions in the hope of advancing not only the knowledge on time representation but also, more broadly, knowledge on how culture shapes cognition.

## AIM AND OUTLINE OF THIS DISSERTATION

This dissertation is dedicated to the different spatializations of time and ventures into the interdisciplinary space that exists between the two research areas already devoted to investigating them. Where the first research area is heavily rooted in anthropology, linguistics, and cognitive psychology and has contributed with its cross-cultural work by showing how different cultural and/or linguistics groups spatialize time, the second research area takes a social psychological and individual difference approach and has contributed by showing the psychological relevance of the different spatializations of time. This dissertation builds on insights from both areas and aims to advance research on time representation through the pursuit of four more specific objectives:

1. This dissertation investigates the extent to which insights from cross-cultural work on time representations are compatible with a psychological approach towards culture. Specifically, it compares and contrasts the culture-as-situated-cognition (CSC) approach with the insights from cross-cultural work on time

representation rooted in anthropology, linguistics, and cognitive psychology. The CSC approach is a prolific cultural theory within psychology, which centers on the way society shapes identity, motivation, cognitive processes, and behavior, with evidence in support for this theory coming mostly from variation documented around the individualism-collectivism distinction (Kühnen et al., 2001; Oyserman, 2011, 2015, 2017; Oyserman & Lee, 2008).

2. This dissertation investigates the stability of the ego- and time-moving representations of time, thereby juxtaposing literature that highlights the dynamic and situated character of the representations with literature that treats these representations as societal or individual difference variables.
3. This dissertation investigates the relation between the ego- and time-moving representations and key cultural factors, namely future orientation, self-concept, and agency.
4. This dissertation assesses the degree to which previously reported relations between different time representations and psychological relevant variables generalize across different cultures and/or linguistic groups.

These objectives are expounded in the following chapters that consist of one theoretical chapter and four empirical chapters. Below, summaries of each chapter are provided.

Chapter 2 constitutes the theoretical heart of this dissertation and lays the foundation on which the empirical chapters are largely based. It provides a framework through which cultural variation in spatializations of time can be understood/summarized, thereby providing a brief overview of the major variations reported in previous literature as well. Moreover, Chapter 2 integrates insights from cross-cultural work on time representation rooted in anthropology, linguistics, and cognitive psychology with the way that culture is seen within a central theory of cultural psychology which considers culture from a more social psychological and identity focused way: the CSC approach. In doing so, it tests the three levels of culture as outlined by the CSC approach outside the traditional individualism-collectivism literature and describes novel research directions for researchers interested in the CSC approach and/or cultural variation in time representation.

In Chapter 3, the stability of the ego- and time-moving representations is examined over a 5-month interval amongst participants from New Zealand. By examining the under-researched question of the stability of the ego- and time-moving representations, this chapter juxtaposes two features of these time representations highlighted in previous literature: the dynamic character of these time representations, highlighted in research looking at how situational factors like spatial primes, event valence, or

temporarily induced emotions are linked to these time representations, and the more stable character of these time representations, highlighted in research looking at how cultural and/or individual differences variables, such as personality characteristics, are linked to these time representations. Chapter 3 also investigates the relation between the ego- and time-moving representations and future orientation. Future orientation is an important (cultural) variable that has been implicated in time representation by previous research (de la Fuente et al., 2014; Li et al., 2018; Richmond et al., 2012). By examining this relation amongst New Zealand participants, this study takes a first step in exploring time representation in this specific sample and contributes to the examination of whether previously reported relations between certain time spatializations and cultural variables generalize across cultures.

Chapter 4 investigates the relation between the ego- and time-moving representations and self-concept. Specifically, it looks at whether an independent self-concept, where the self is seen as independent from others, as intrinsically agentic with unique characteristics and dispositions, is related to an ego-moving representation, where the self moves and temporal events are stationary, and whether an interdependent self-concept, where the self is seen as dependent on other, as fundamentally embedded in relational context, is related to a time-moving representation, where temporal events move and the ego is stationary. Self-concept is a focal variable within cultural psychology that underlies much of the documented cultural variation (Brewer & Gardner, 1996; Markus & Kitayama, 1991; Oyserman & Lee, 2008; Singelis, 1994; Trafimow, Triandis, & Goto, 1991; Triandis, 1989). It has been found to have widespread downstream consequences on cognition and behavior and is implicated in time representation by research linking both to differences in agency and estimations of temporal proximity (Bernritter, Loermans, Verlegh, & Smit, 2017; Duffy & Feist, 2014; Duffy et al., 2014; Kühnen et al., 2001; Kühnen, Hannover, Pöhlmann, & Roeder, 2013; Lee, Lee, & Kern, 2011; Richmond et al., 2012; Spassova & Lee, 2013). The relation between self-construal and the ego- and time-moving representations is tested across six studies, using both correlational and experimental designs, and using both Dutch and English-speaking samples.

Chapter 5 also focuses on the ego- and time-moving representations but investigates their relation to a different culturally relevant variable: agency. Agency, like self-concept, has been found to vary across cultures/languages (Fausey, Long, Inamori, & Boroditsky, 2010; Kashima et al., 2005; Kashima & Kashima, 2003; Markus & Kitayama, 1991; Menon, Morris, Chiu, & Hong, 1999) and has found to be related to the ego- and time-moving representations in previous research (Duffy & Feist, 2014; McGlone & Pfiester, 2009; Richmond et al., 2012). We build on this research and examine the causal mechanism underlying it using an experimental design in which we manipulate agency between



(English) participants. In addition, we investigate the generalizability of this relation across cultures/languages by replicating this experiment amongst speakers of Dutch. An additional experiment is conducted amongst speakers of Dutch to test whether those who naturally adopt an ego-moving representation score higher on personal agency compared to those who adopt a time-moving representation.

Chapter 6 extends the findings of Chapter 5 by investigating whether the previously well-documented relation between event valence and time representation, with positive valence being linked to the ego-moving representation and negative valence being linked to the time-moving representation, amongst speakers of English (Margolies & Crawford, 2008; McGlone & Pfister, 2009), can also be observed amongst speakers of Dutch. Event valence was manipulated between participants and time representation gauged similarly as has been done in studies using speakers of English.

Chapter 7 concludes this dissertation. The theoretical and empirical chapters are summarized and the overarching findings are discussed in light of the objectives this dissertation set out to achieve. In doing so, it discusses issues of relevance for (psychological) researchers working in- and outside of the domain of time representation and culture.

Before moving onto the next chapter, a few general considerations should be noted by the reader. Firstly, the remaining chapters of this dissertation, with the exception of the concluding chapter, have all been published or submitted for publication to different scientific outlets before completing this dissertation. Consequently, each chapter can be read independently from other chapters whilst making a certain level of repetition across these chapters inevitable. Secondly, the studies conducted as part of this dissertation do not fall under the current definition of medical research specified by Dutch legislation and therefore do not require formal review by an ethics committee. All studies were, of course, in strict accordance with the guidelines issued by the ethics committee of the Faculty of Behavioral and Movement Sciences at the *Vrije Universiteit Amsterdam* for non-medical behavioral research. Moreover, the materials and procedures of the study reported in Chapter 3, using participants from New Zealand, were checked and approved by Victoria University of Wellington; the materials and procedures of the studies reported in Chapter 4 and Chapter 5, using participants from the United States, were checked and approved by the University of Southern California University Park Institutional Review Board. Thirdly, many of the studies in this dissertation were carried out before pre-registration became a common practice within the field and our research group. Nevertheless, in an attempt to promote transparency and other related open science practices most data and

materials have been made publicly available through the Open Science Framework. Details regarding this can be found in the specific chapters. Lastly, two conceptual issues should be pointed out. One, within this dissertation the term spatializations of time is used to denote the cognitive representations of time people use to think and talk about time that are grounded in their representation of space. Occasionally, the term representations of time is used to denote the same concept, even though it should be noted that time is sometimes thought about non-spatially. For example, time can also be thought about as money or a valuable commodity, attested to by expressions like *do not waste my time* and *in the long run, this will hopefully save me time* (Lakoff & Johnson, 1980). Within the literature, the different terms used to denote the same or related concepts are almost as plentiful as there are researchers working within the field. Among the most common ones are temporal metaphors, time-space mappings, temporal frames of reference, and temporal perspectives. While nuanced differences exist between these terms, reflective of the different approaches used to study the representation of time, there is much overlap in what these terms refer to. For a comprehensive overview and theoretically sound comparison please see Bender and Beller (2014). Two, it is beyond the scope of this dissertation to fully compare and contrast all different definitions of culture. For the purpose of this dissertation, culture is defined as a framework that shapes values, motivation, identity, behavior, attention, and cognitive processes; culture unifies people within groups and perpetuates differences between groups. Related to this, it should be noted that language, within the scope of this dissertation, is considered an important cultural variable even though conceptual differences may exist between them and they do not always overlap: within linguistic groups different cultural groups may be found and, vice versa, within cultural groups different linguistic groups may be found.