Ideal Life Expectancy

The Determinants, Processes, and Consequences of the Desire to Live a Long Life

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Extended Abstract

The rapid increase in human life expectancy during the last decades sees many individuals confronted with the prospect of living a very long life. Whereas advances in life expectancy are often being celebrated in scientific communities, it is still largely unclear to what extent individuals embrace the prospect of a long life and wish to reach a very old age. To address this issue, the present dissertation focuses on the construct of ideal life expectancy, which can be defined as a personal desire regarding the length of one's life. Understanding personal ideal life expectancies, and the antecedents, processes, and consequences surrounding them, is particularly important when assuming that individuals' beliefs, choices, and behavior can affect their aging process and actual length of life.

Within the general introduction of this dissertation (see Chapter 1), the construct of ideal life expectancy is embedded in the theoretical frameworks of self-discrepancy theory and the psychology of life-longings. With this, it is highlighted that individual ideal life expectancies constitute self-related ideals, which can and often do diverge from perceptions of reality (i.e., perceived life expectancies). Indeed, many individuals seem to wish for a life longer than the one they anticipate, express a certain dissatisfaction with the length of their life, and experience a phenomenon we have labeled as subjective life expectancy discordance (i.e., the discordance between ideal and perceived life expectancy). In all this, ideal life expectancy is however a construct with considerable interindividual differences and it is scarcely understood why some individuals consider their perceived life expectancy ideal, whereas others would opt for rather short or unrealistically long lives.

The central research questions of this dissertation focus on the contexts and experiences (i.e., culture, age, health, and the coronavirus pandemic) as well as personal belief systems and mindsets regarding living, aging, and death that can determine individual ideal life expectancies. Furthermore, it is addressed how processes of anticipation, evaluation, and contrasting likely surround the immediate formation of ideal life expectancies. When forming their ideal life expectancy, individuals need to rely on more general anticipations of their personal life in old age as well as the specific anticipation of perceived life expectancy. Individuals can then evaluate those anticipations as (un-)desirable, (un-)acceptable, or even threatening (cf. aging-related

fears) and can be encouraged or discouraged to wish for a certain life expectancy. Consequently, individuals are free to actively decide on an ideal life expectancy that is in concordance and acceptance of their anticipations, or in discordance and in contrast to their anticipations. Here, it is studied how certain aging-related fears as well as general anticipations of the future relate to ideal life expectancies. Lastly, affective and behavioral consequences of individual ideal life expectancies are investigated. Particularly, it is assumed that (strong) discordances between perceived and ideal life expectancies can stimulate health behavior change, but also negatively affect psychological well-being and foster experiences of dissatisfaction and despair. The specific research questions have resulted in four empirical research papers gathered in this cumulative dissertation.

Paper #1 (see Chapter 2) summarizes prior research on longevity motivation and identifies three common belief systems and mindsets: The essentialist mindset idealizes an infinite life and aims at conquering or halting a biologically determined aging process. The medicalist mindset evaluates aging based on health and sees longevity as burdened only when pathology occurs. The stoicist mindset is a mindset of acceptance, which tolerates the challenges and vulnerabilities of the aging process as long as dignity and meaning can be preserved. The mindsets are then empirically explored in regard to the construct of ideal life expectancy. Results indicate that culture, self-rated health, and death acceptance act as potential determinants of ideal life expectancy. Additionally, the interplay of perceived and ideal life expectancy is able to predict health behavior change. Lastly, ideal life expectancy and its discordance to perceived life expectancy are established as stable and reliable constructs.

Paper #2 (see Chapter 3) targets the relationship between ideal and perceived life expectancy more explicitly. Results indicate that average ideal life expectancies lie cleary above average perceived life expectancies and that most individuals would strive for a longer life than they anticipate. This experience of subjective life expectancy discordance seems to ease in old age, when ideal and perceived life expectancies become more concordant. In line with predictions of self-discrepancy theory, a stronger subjective life expectancy discordance was negatively related to different aspects of psychological well-being. Over the time span of two years, subjective life expectancy discordance predicted increases in negative affect. Additionally, subjective life expectancy discordance contributed to another form of subjective aging discordance: Individuals wishing to live longer than they anticipated to, also wished to be younger again than they perceived

themselves to be. Thus, a discordance and dissatisfaction regarding the future aging process and length of life seemed to predict a discordance and dissatisfaction regarding the current aging process.

Paper #3 (see Chapter 4) investigates a number of psychological constructs targeting the finitude of life (i.e., future time perspective with its three subcomponents future time opportunity, extension, and constraint, fear of death, and ideal life expectancy) in times of the coronavirus pandemic. Whereas the research indicates that future time perspectives decreased over the course of the pandemic and that fear of death peaked at its beginning, ideal life expectancies remained surprisingly stable throughout the pandemic. Ideal life expectancies thus seem to be shaped by more enduring contexts and experiences (e.g., health state and socioeconomic status) rather than momentary and transitory ones. Furthermore, it is explored how ideal life expectancy relates to the other psychological constructs of finitude: Next to the respective cross-sectional relations, higher ideal life expectancy seemed predictive of increases in future time opportunity, future time extension, and fear of death, leading up to the topic of the fourth publication.

Paper #4 (see Chapter 5) focuses on the role of aging-related fears for individual ideal life expectancies. Following predictions of terror management theory, it is assumed that a strong fear of death is related to pushing death into the more distant future and wishing for a longer life. In contrast, fears regarding the aging process, such as the fear of loneliness in old age and the fear of aging-related diseases could color anticipations of aging in such negative and threatening ways that individuals may prefer to avoid those by wishing for a shorter life. Results indicate that differentiations mainly occur in regard to whether individuals would like to reach a very old age. Indeed, a stronger fear of death was related to higher ideal life expectancies and the wish to reach a very old age across two studies. Additionally, individuals fearing loneliness in old age or aging-related diseases while being unafraid of death, wished for particularly short lives. Explicitly negative anticipations of the aging process such as aging-related fears can thus partly explain why individuals wish for longer or shorter lives.

In the general discussion (see Chapter 6), the findings of the four research papers are summarized and synthesized. In regard to contexts and experiences, aspects of an individual's biography such as culture, gender, age, socioeconomic status, and health state seemed decisive for individual ideal life expectancies. In contrast, ideal life expectancies seem rather unaffected by temporary contexts such as the coronavirus pandemic. Three

overarching belief systems and mindsets for longevity motivation were identified. Additionally, individuals' views on death (i.e., fear of death and death acceptance) were associated with ideal life expectancies. Regarding the more immediate formation of ideal life expectancies, reciprocal processes between anticipations of the own aging process and future (e.g., future time perspective) and personal ideal life expectancies can be assumed. Research furthermore supports the assumption that individuals actively differentiate between the more rational anticipation that is perceived life expectancy and the personal desire that is ideal life expectancy. Whereas most individuals wish to live longer than they anticipate, particularly older adults also experience concordance between their ideal and perceived life expectancy. The general discussion also highlights and discusses the finding that a subgroup of individuals wishes to live less long than they anticipate to. Lastly, next to ideal life expectancy's impact on health behaviors and psychological well-being, there seem to be cognitive consequences in regard to states of acceptance, the envisioning of the future, and potentially, active goal-setting and intention-building. The discussion concludes in an expanded research model and highlights social contexts and relationships, aspects of subjective aging, and the end of life as potential areas for future research surrounding ideal life expectancy.

The main implications of this dissertation refer to the reliability and stability of the construct of ideal life expectancy, its embeddedness in the research on self-related ideals and the research on subjective aging, and the more far-reaching content of the identified mindsets of longevity motivation. On a practical level, individual and average ideal life expectancies could affect research questions, medical treatment and decision making, as well as societal views on old and very old individuals. Due to relations to negative psychological well-being and fear of death, the constructs of ideal life expectancy and subjective life expectancy discordance may furthermore be of importance for overall psychopathology. Most importantly, however, this dissertation is able to show that many individuals indeed appreciate the prospect of a long life—a finding that could be utilized to foster a positive but realistic approach to living into very old age.

Deutsche Zusammenfassung

Der steile Anstieg der menschlichen Lebenserwartung in den letzten Jahrzehnten sieht viele Menschen mit der Aussicht auf ein sehr langes Leben konfrontiert. Während die zunehmende Lebenserwartung im wissenschaftlichen Kontext zumeist als positiv angesehen wird, ist noch überwiegend unklar, inwieweit einzelne Menschen diese Aussicht auf ein langes Leben wertschätzen und den Wunsch haben, selbst ein sehr hohes Alter zu erreichen. Um diese Thematik zu adressieren, konzentriert sich die vorliegende Dissertation auf das Konstrukt der idealen Lebenslänge, die als persönlicher Wunsch bzgl. der eigenen Lebenszeit definiert werden kann. Das Verständnis individueller idealer Lebenslängen und der Determinanten, Prozesse und Konsequenzen, die diese ausmachen, ist besonders wichtig unter der Annahme, dass individuelle Überzeugungen, Entscheidungen und Verhaltensweisen den Alternsprozess und die tatsächliche Lebenslänge beeinflussen können.

In der allgemeinen Einleitung dieser Dissertation (siehe Kapitel 1) wird das Konstrukt der idealen Lebenslänge zunächst in die theoretischen Rahmenmodelle der Selbstdiskrepanz und der Psychologie der Sehnsucht eingebettet. Damit wird hervorgehoben, dass ideale Lebenslängen selbstbezogene Ideale darstellen, die von der wahrgenommenen Realität (d. h., der wahrgenommen Lebenslänge) abweichen können und es häufig auch tun. Tatsächlich scheinen sich viele Menschen ein längeres Leben zu wünschen als sie es erwarten. Sie bringen damit eine gewisse Unzufriedenheit mit der Länge ihres Lebens zum Ausdruck und erleben ein Phänomen, dass wir als subjektive Diskordanz der Lebenslänge (d. h., die Diskordanz zwischen der idealen und wahrgenommenen Lebenslänge) betitelt haben. Bei all dem ist die ideale Lebenslänge allerdings ein Konstrukt mit beträchtlichen interindividuellen Unterschieden und es gibt bisher nur wenige Erklärungsansätze, warum einige Menschen ihre wahrgenommene Lebenserwartung als ideal ansehen, während sich andere ein eher kurzes oder unrealistisch langes Leben wünschen würden.

Die zentralen Forschungsfragen dieser Dissertation konzentrieren sich zum einen auf Kontexte und Erfahrungen (z. B. Kultur, Alter, Gesundheitszustand oder die Coronapandemie) sowie persönliche Glaubenssysteme und Haltungen in Bezug auf Leben, Altern und Sterben, die ideale Lebenslängen erklären können. Zum anderen wird adressiert wie Prozesse der Antizipation, Evaluation und Kontrastierung die unmittelbare

Entstehung idealer Lebenslängen begleiten. Wenn Menschen ihre ideale Lebenslänge festsetzen, sind sie auf allgemeinere Antizipationen bzgl. ihres eigenen Lebens im hohen Alter sowie auf die spezifische Antizipation der wahrgenommenen Lebenslänge angewiesen. Diese Antizipationen können individuell als (un-)erwünscht, (in-)akzeptabel oder sogar bedrohlich (vgl. alternsbezogene Ängste) bewertet werden und Menschen somit ermutigen oder entmutigen, sich eine bestimmte Lebenslänge zu wünschen. Folglich steht es Menschen frei, sich aktiv für eine ideale Lebenslänge zu entscheiden, die konkordant und akzeptierend oder diskordant und kontrastierend gegenüber den eigenen Antizipationen ist. In diesem Zusammenhang wird betrachtet, wie alternsbezogene Ängste und allgemeinere Antizipationen der Zukunft mit der idealen Lebenslänge in Beziehung stehen. Zuletzt werden affektive und behaviorale Konsequenzen individueller idealer Lebenslängen untersucht. Insbesondere wird erwartet, dass (starke) Diskordanzen zwischen idealer und erwarteter Lebenslänge Veränderungen im Gesundheitsverhalten vorhersagen können. Auch wird erwartet, dass diese das psychische Wohlbefinden negativ beeinflussen und zu Erfahrungen der Unzufriedenheit und Verzweiflung beitragen können. Die spezifischen Forschungsfragen resultierten in den vier Forschungspapieren, die in der vorliegenden kumulativen Dissertation gesammelt sind.

Forschungspapier #1 (siehe Kapitel 2) fasst bisherige Forschung zur Motivation für Langlebigkeit zusammen und identifiziert hierbei drei verbreitete Glaubenssysteme und Haltungen: Die essentialistische Haltung idealisiert ein unbegrenztes Leben und hat das Ziel einen biologisch determinierten Alternsprozess anzuhalten oder ganz zu überwinden. Die medikalistische Haltung bewertet Altern basierend auf Gesundheit und sieht Langlebigkeit nur dann als belastend, wenn Krankheit auftritt und das Leben erschwert. Die stoizistische Haltung ist eine Haltung der Akzeptanz, die Herausforderungen und Vulnerabilitäten als Teil des Alternsprozesses akzeptiert solange Würde und Bedeutung aufrechterhalten werden können. Diese Haltungen werden anschließend in Bezug auf das Konstrukt der idealen Lebenslänge empirisch illustriert. Die Ergebnisse zeigen, dass Kultur, selbsteingeschätzte Gesundheit und Todesakzeptanz als potentielle Determinanten der idealen Lebenslänge fungieren. Zusätzlich sagt das Zusammenspiel von idealer und wahrgenommener Lebenslänge Veränderungen im Gesundheitsverhalten vorher. Schließlich konnten ideale Lebenslänge und die subjektive Diskordanz der Lebenslänge als stabile und reliable Konstrukte etabliert werden.

Forschungspapier #2 (siehe Kapitel 3) zielt expliziter auf die Beziehung zwischen idealer und wahrgenommener Lebenslänge ab. Die Ergebnisse zeigen, dass die durchschnittliche ideale Lebenslänge klar über der durchschnittlichen wahrgenommenen Lebenslänge liegt und dass die meisten Menschen sich wünschen länger zu leben, als sie es tatsächlich erwarten. Dieses Erlebnis der subjektiven Diskordanz der Lebenslänge scheint im höheren Alter abzunehmen; stattdessen erscheinen ideale und wahrgenommene Lebenslänge zunehmend konkordant. Entsprechend der Annahmen der Selbstdiskrepanz-Theorie hing eine starke subjektive Diskordanz der Lebenslänge negativ mit verschiedenen Aspekten des psychischen Wohlbefindens zusammen. Über einen Zeitraum von zwei Jahren sagte eine subjektive Diskordanz der Lebenslänge Zunahmen im negativen Affekt voraus. Außerdem verstärkte eine subjektive Diskordanz der Lebenslänge eine andere subjektive alternsbezogene Diskordanz: Personen, die sich wünschten länger zu leben als sie es erwarteten, wünschten sich ebenfalls (wieder) jünger zu sein, als sie sich wahrnahmen. Somit scheint eine Diskordanz und Unzufriedenheit bzgl. des zukünftigen Alternsprozesses und der Lebenslänge, eine Diskordanz und Unzufriedenheit bzgl. des gegenwärtigen Alternsprozesses vorherzusagen.

Forschungspapier #3 (siehe Kapitel 4) untersucht psychologische Konstrukte der Endlichkeit (d. h. die Zukunftszeitperspektive mit den drei Subkomponenten zukunftsbezogene Möglichkeiten, zukunftsbezogene Ausdehnung und zukunftsbezogene Einschränkungen, Ausdehnung der Zukunft und Einschränkungen der Zukunft, die Angst vor dem Tod und die ideale Lebenslänge) in der Zeit der Coronaviruspandemie. Während die vorliegende Forschung zeigt, dass Zukunftszeitperspektiven im Laufe der Pandemie abnehmen und die Angst vor dem Tod zu Beginn der Pandemie einen Höhepunkt erreichte, blieb die individuelle ideale Lebenslänge überraschend stabil. Die ideale Lebenslänge scheint damit vor allem von anhaltenden Kontexten und Erfahrungen (z. B. dem Gesundheitszustand und dem sozioökonomischen Status) geprägt zu werden und weniger von vorübergehenden. Darüber hinaus wird untersucht wie die ideale Lebenslänge mit den anderen psychologischen Konstrukten der Endlichkeit zusammenhängt: Neben den jeweiligen querschnittlichen Beziehungen sagte eine höhere ideale Lebenslänge die zunehmende Warhnehmung von zukunftsbezogenen Möglichkeiten und zukunftsbezogener Ausdehnung sowie einen Anstieg in der Angst vor dem Tod vorher, was zum Thema des vierten Forschungspapiers überleitet.

Forschungspapier #4 (siehe Kapitel 5) konzentriert sich auf die Rolle alternsbezogener Ängste für die individuelle ideale Lebenslänge. Ausgehend von Annahmen der Terror-Management-Theorie wird erwartet, dass eine starke Angst vor dem Tod mit einem Zurückdrängen des Todes in die entfernte Zukunft und dem Wunsch nach einem längeren Leben assoziiert ist. Im Gegensatz dazu könnten Ängste bzgl. des Älterwerdens, wie die Angst vor Einsamkeit im Alter und die Angst vor altersbedingten Erkrankungen, Antizipationen des Älterwerdens so negativ und bedrohlich erscheinen lassen, dass Menschen ein kürzeres Leben bevorzugen würden. Die Ergebnisse zeigen, dass insbesondere der Wunsch ein sehr hohes Alter zu erreichen zwischen Menschen mit unterschiedlichen Ängsten differenziert. Tatsächlich war in zwei Studien eine ausgeprägtere Angst vor dem Tod mit einer höheren idealen Lebenslänge und dem Wunsch, ein sehr hohes Alter zu erreichen, assoziiert. Ferner wünschten sich Menschen, die wenig Angst vor dem Tod hatten, dafür aber Einsamkeit im Alter oder altersbedingte Erkrankungen fürchteten, eine besonders kurze Lebenslänge. Explizit negative Antizipationen des Älterwerdens wie etwa alternsbezogene Ängste können damit zumindest teilweise erklären, warum sich Menschen ein längeres oder kürzeres Leben wünschen.

In der allgemeinen Diskussion (siehe Kapitel 6) werden die Befunde der vier Forschungspapiere zusammengefasst und integriert. Im Bereich der Kontexte und Erfahrungen waren es vor allem Aspekte der individuellen Biographie wie Kultur, Geschlecht, Alter, sozioökonomischer Status und der Gesundheitszustand, die für die ideale Lebenslänge entscheidend sind. Im Gegenzug war die ideale Lebenslänge kaum von vorübergehenden Kontexten wie der Coronaviruspandemie betroffen. Es konnten drei umfassende Glaubenssysteme und Haltungen bzgl. Langlebigkeit identifiziert werden. Darüber hinaus hingen persönliche Ansichten zum Tod (d. h. die Angst vor dem Tod und die Todesakzeptanz) mit der idealen Lebenslänge zusammen. In Bezug auf die unmittelbare Entstehung idealer Lebenslängen können reziproke Prozesse zwischen der idealen Lebenslänge und Antizipationen des Alternsprozesses und der Zukunft (z. B. die Zukunftszeitperspektive) angenommen werden. Die Ergebnisse stützen außerdem die Annahme, dass Individuen aktiv zwischen der eher rationalen Antizipation der wahrgenommenen Lebenslänge und dem persönlichen Wunsch der idealen Lebenslänge differenzieren. Während sich die meisten Menschen wünschen, länger zu leben als sie es erwarten, erleben besonders auch ältere Menschen eine subjektive Konkordanz zwischen

ihrer idealen und wahrgenommenen Lebenslänge. Die allgemeine Diskussion hebt aber auch den Befund hervor, dass eine kleinere Subgruppe den Wunsch zu haben scheint, kürzer zu leben als subjektiv erwartet. Schließlich scheint es neben dem Einfluss der idealen Lebenslänge auf Gesundheitsverhalten und psychisches Wohlbefinden auch kognitive Konsequenzen in Bezug auf Akzeptanz, Zukunftsvorstellungen und möglicherweise auch aktive Zielsetzung und das Bilden von Intentionen zu geben. Die Diskussion schließt in einem erweiterten Forschungsmodell und schlägt soziale Kontexte und Beziehungen, Aspekte des subjektiven Alterns und das Lebensende als potentielle Gebiete für Forschung rund um das Konstrukt der idealen Lebenslänge vor.

Die wichtigsten Implikationen dieser Dissertation beziehen sich auf die Reliabilität und Stabilität des Konstrukts der idealen Lebenslänge, seine Einbettung in die Forschung um selbstbezogene Ideale und das subjektive Altern, sowie die weitreichenderen Inhalte der drei identifizierten Haltungen bzgl. Langlebigkeit. Auf der praktischen Ebene könnten individuelle und durchschnittliche ideale Lebenslängen Forschungsfragen, medizinische Behandlung und Entscheidungsfindung, sowie gesellschaftliche Sichtweisen auf alte und sehr alte Menschen beeinflussen. Aufgrund ihrer Beziehungen zu einem niedrigeren psychischen Wohlbefinden und der Angst vor dem Tod könnten die Konstrukte der idealen Lebenslänge und der subjektiven Diskordanz der Lebenslänge ferner im Bereich der Psychopathologie relevant sein. Vor allem aber zeigt die vorliegende Dissertation auf, dass die meisten Menschen die Aussicht auf ein langes Leben wertschätzen – ein Befund, der genutzt werden kann um eine positive und realistische Herangehensweise an ein Leben bis in das sehr hohe Alter zu fördern.

List of Publications for the Cumulative Dissertation

Research Paper #1

Lang, F. R., & Rupprecht, F. S. (2019). Motivation for longevity across the lifespan: An emerging issue. *Innovation in Aging, 3*(2), 1-11. https://doi.org/10.1093/geroni/igz014

Research Paper #2

Rupprecht, F. S., & Lang, F. R. (2020). Personal ideals of aging and longevity: The role of subjective discordances. *Psychology and Aging, 35*(3), 385-396. https://doi.org/10.1037/pag0000455

Research Paper #3

Rupprecht, F. S., Martin, K., Kamin, S., & Lang, F. R. (2021). COVID-19 and perceiving finitude: Associations with future time perspective, death anxiety, and ideal life expectancy. Advance online publication. *Psychology and Aging.* https://doi.org/10.1037/pag0000661

Research Paper #4

Rupprecht, F. S., Martin, K., & Lang, F. R. (2021). Aging-related fears and their associations with ideal life expectancy. Advance online publication. *European Journal of Ageing.* https://doi.org/10.1007/s10433-021-00661-3

1

General Introduction

General Introduction: Chapter Overview

Introduction

Would you not think him an utter fool
who wept because he was not alive
a thousand years ago?
And is he not just as much a fool
who weeps because he will not be alive
a thousand years from now?
It is all the same;
you will not be and you were not.
Neither of these periods of time belongs to you.

You have been cast upon this point in time;
if you could make it longer,
how much longer shall you make it?

Seneca: Ad Lucilium Epistulae Morales
LXXVII, 11-12

Seneca's epistle to Lucilius, the procurator of Sicily, offers views on the temporal limitations of human life from nearly 2000 years ago. Since then, its content has lost none of its relevance and validity. In every new generation, humans are still coming to terms with the finiteness of their existence. Many strive for just some more years of life and not so few wish to overcome aging and death completely. The longing for an extended life seems to remain, despite the crucial increases in life expectancies since Seneca's times. This increase in life expectancies has particularly been achieved during the last decades, but it is still continuing today in many parts of the world (Kontis et al., 2017). As a consequence, within the next decades the number of individuals reaching ages nowadays seen as exceptionally high (e.g., more than 100 years of age) is projected to increase considerably (De Beer et al., 2017). Worldwide, the number of centenarians has increased from 95,000 in 1990 to 451,000 in 2015. Until 2050, this number is estimated to grow eightfold (approx. 3,676,000 centenarians; Stepler, 2016).

The prospect of living such long lives comes with more time to pursue and achieve personal goals and the chance for additional and fulfilling years, but also the challenge to envision and prepare for an age period that is relatively new and therefore, unknown and unstructured (Freund et al., 2009; Riley et al., 1994). It also comes with new challenges

and research questions for various disciplines such as aging psychology: Do humans indeed embrace those increases in life expectancy (cf. Lang et al., 2007)? Do they look forward to a long life or do they fear certain aspects of it? Do they still wish to live much longer than they can now anticipate to?

How individuals view and approach the prospect of a long life is particularly important when assuming that humans are—at least within certain boundaries—the producers of their own development (Brandtstädter, 1989; Lerner & Busch-Rossnagel, 1981). Precisely, many individuals have the opportunity[1] to actively influence the length of their life through their health and risk behaviors (e.g., smoking and physical inactivity; Centers for Disease Control & Prevention, 2008; Nocon et al., 2008), their general approach towards life (e.g., optimism and purpose in life; Giltay et al., 2004; Hill & Turiano, 2014), as well as personal choices influential for the course of life (e.g., in regard of social relationships; Holt-Lunstad et al., 2010; Lang & Heckhausen, 2006). Even more so, individuals' attitudes and anticipations influence how they approach and navigate old age (Diehl et al., 2014; Kornadt et al., 2015; Wurm et al., 2013). For those two reasons, that is, the influence individuals have on their own life expectancy and on how they approach old age, it is crucial to understand the life expectancies individuals consider ideal; to explore the ages individuals would like to reach just as well as the ages they would prefer not to experience, and to understand the determinants, processes, and consequences that underlie such personal ideal life expectancies.

The Construct of Ideal Life Expectancy

In the scope of this dissertation, the core construct of ideal life expectancy—also referred to as desired lifetime (e.g., Cicirelli, 2002) or preferred life expectancy (e.g., Bowen & Skirbekk, 2017)—is understood as a personal desire regarding the length of one's life. Personal ideal life expectancies are assumed to be consistently related to individuals' contexts and experiences, and to be reflective of overarching belief systems and mindsets regarding the aging process (= determinants of ideal life expectancies). As a form of wishful thinking, ideal life expectancies are likely formed against the background of and often in contrast to individuals' anticipations regarding life in old age and the length

[1] Importantly, sudden and unforeseen illness, violence, war, catastrophes, as well as adverse and excruciating living conditions may take this opportunity from individuals (for the latter see Puterman et al., 2020).

of life. Processes of anticipation, evaluation, and contrasting should thus underlie the formation of ideal life expectancies (= processes behind ideal life expectancies). Ideal life expectancies can serve as an indicator for how individuals approach their own aging and are assumed to come with affective and behavioral consequences for the individual (= consequences of ideal life expectancies). As prior research on ideal life expectancy (and self-related aging ideals in general) is particularly scarce, the aim of this dissertation was to gain a deeper understanding for the construct of ideal life expectancy while strengthening its theoretical embedding within lifespan and aging psychology.

In the scope of this dissertation, ideal life expectancy was assessed with the question "To what age would you like to live?" and study participants were encouraged to answer with a concrete number of years. Previous studies have mostly used similar assessments (e.g., "If you could decide, how long would you want to live? That is, until what age?" in Bowen et al., 2020, p. 160, or "If you could choose how long you lived, how long would that be?" in Hornsey et al., 2018, p. 1395). Alternative but closely related operationalizations of ideal life expectancy include asking individuals how many more years they would like to live (Cicirelli, 2002; Cicirelli, 2011; Karppinen et al., 2012; Lawton et al., 1999) or whether they would like to reach a specific age—mostly the age of 100 years (Brandão et al., 2019; Karppinen et al., 2016; Ribeiro et al., 2018).

In contrast to the more present-oriented constructs of *will-to-live* and *wish-to-die* (cf. Bornet et al., 2020; Carmel, 2001), which are particularly relevant when death is tangible, as it is for individuals in old age (Carmel et al., 2017), individuals with terminal diseases (Breitbart et al., 2000; Chochinov et al., 1999), and individuals in serious psychological distress (Bryan et al., 2016), ideal life expectancy is a future-oriented construct. As such, ideal life expectancy pertains to an unknown future and should rely strongly on individuals' anticipations of the aging process. Depending on the chronological age of an individual, this unknown future can be more or less distant. The age period to which ideal life expectancy refers (i.e., old age or very old age) should however be highly comparable for individuals of all ages.

In contrast to ideals pertaining to broader units such as families, work places, and societies (cf. Hornsey et al., 2018), ideal life expectancies constitute self-related ideals. In the following, a more general theoretical background on self-related ideals is therefore presented and established. After this, potential determinants, processes, and con-

sequences are derived specifically for ideal life expectancy. Throughout the introduction, the foci and research questions of the four research papers part of this dissertation (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3; Rupprecht, Martin, & Lang, 2021, Paper #4) are highlighted.

Theoretical Background on Self-Related Ideals

Self-related ideals reflect desires, hopes, and wishes individuals hold for their personal life and development (cf. Higgins, 1987). Individuals can hold self-related ideals they anticipate to become reality and actively strive to reach them. Much more often, ideals are however a form of wishful thinking and can be vastly different from reality and from what an individual anticipates to happen. Particularly when self-related ideals refer to the distant future of an individual, they reflect rather abstract but oftentimes stable desires. As such, they are not equatable with goals as they (a) are less connected to clear actions and intentions, (b) are less associated with immediate time frames and situations, and (c) are often seen as less feasible (Achtzinger & Gollwitzer, 2010; Gollwitzer, 1993; Mayser et al., 2008; Perugini & Bagozzi, 2004). Nevertheless, self-related ideals can be crucial for an individual's development as they are highly reflective of central belief systems and mindsets. *Self-Discrepancy Theory* (Higgins, 1987) and the *Theory of Life-Longings* (Scheibe et al., 2007) highlight the relevance of self-related ideals for the development of an individual.

Self-Discrepancy Theory

Self-discrepancy theory (Higgins, 1987) is one of the most prominent theories surrounding self-related ideals. The theory assumes that individuals choose and evaluate their personal ideals against the background of individual self-perceptions. Self-related ideals can hereby be in concordance with individual self-perceptions and the overall self-concept. Such a state of concordance indicates that individuals are satisfied with and accepting of certain aspects of themselves. Much more often, individuals however report and experience discrepancies between their ideals and self-perceptions—they wish to be different than they perceive themselves to be. Higgins (1987) hypothesized that the presence of such discrepancies between self-related ideals and self-perceptions is associated with dejection-related emotions such as disappointment and sadness. Within the last decades, research has supported this claim and expanded the negative

consequences of self-discrepancies to overall psychological well-being (Barnett et al., 2017) and psychopathology (Mason et al., 2019). Self-discrepancy theory thus suggests that self-related ideals unfold their meaning in relation to self-perceptions and anticipations of the self in the future: Ideals that are in concordance or close to individuals' perceptions and anticipations indicate a satisfaction and acceptance of oneself and one's anticipated future. Self-related ideals that are vastly different from self-perceptions and anticipations should however indicate that individuals are dissatisfied with their current or anticipated future developmental state and do not consider it ideal. Such discordant self-related ideals should thus be associated with lower psychological well-being and overall feelings of dissatisfaction and despair.

Theory of Life-Longings

The theory of life-longings (Scheibe et al., 2007) goes somewhat further and focuses on self-related ideals that are explicitly unrealistic and unfeasible, yet present and stable within an individual's development. In addition to (a) what should ideally be, but is not, life longings include ideals of (b) what should have been, but was not, as well as ideals of (c) what should happen in the future, but most likely will not. According to Scheibe and colleagues (2007), longings are utopian conceptions of an ideal development, which stem from an individual's reflection and evaluation of life, are characterized by a sense of incompleteness and imperfection, come with ambivalent emotions, are highly symbolic, and involve retrospection, concurrent evaluation, as well as prospection. As a form of wishful thinking, longings allow individuals to actively distance themselves from an undesirable reality and to ponder a different, maybe even utopian life. Despite their unfeasibility, longings are still expected to give the individual a general sense of direction and elicit behavior towards the idealized state (Scheibe et al., 2007). The theory of life-longings shares the assumption of self-discrepancy theory that unfeasible ideals vastly different from self-perceptions and anticipations can result in lower psychological well-being (Mayser et al., 2008).

Self-Related Aging Ideals and Ideal Life Expectancy

Transferred to self-related aging ideals and more specifically, to ideal life expectancy, several assumptions arise. First, aging ideals can be concordant with aging self-perceptions and anticipations of the future aging process. The age an individual would currently wish to be (i.e., *ideal age*; see Hubley & Hultsch, 1994) might thus be

concordant with the age an individual feels to be (cf. Rupprecht & Lang, 2020, Paper #2). Similarly, ideal life expectancies could be concordant with perceived life expectancies, that is, the length of life individuals anticipate for themselves (Griffin et al., 2013). More often, aging ideals would however be discordant from aging self-perceptions and anticipations of the future. Specifically, individuals often wish to be younger than they feel to be (Chopik et al., 2018) and just as in Seneca's times individuals still often wish to live longer than they anticipate they will (Bowen et al., 2020).

In order to gain a full understanding of ideal life expectancies, it is thus important to understand them against the background of individual perceived life expectancies. For example, an ideal life expectancy of 95 years would have very different implications when an individual actually anticipates to live for 95 years (due to a healthy lifestyle and the long lives of both parents), than when an individual anticipates to only live for 70 years (due to major cardiovascular risk factors). In the former case, the individual would express satisfaction with the personally perceived life expectancy and would experience concordance between ideals and anticipations regarding the length of life. In the latter case, the individual would express dissatisfaction with the personally perceived life expectancy and experience a discordance between self-related ideals and anticipations.

This relation between perceived and ideal life expectancies is covered by the construct of *subjective life expectancy discordance* and reflects a subjective state of discordance or concordance between self-related ideals and anticipations regarding the length of life (see Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2). In relation to self-discrepancy theory (Higgins, 1987), ideal life expectancy can hereby be seen as a self-related ideal, perceived life expectancy as a self-perception and self-related anticipation, and subjective life expectancy discordance as a self-discrepancy between those ideals and anticipations. Table 1.1 gives an overview of the definitions of ideal life expectancy, perceived life expectancy, and subjective life expectancy discordance in relation to self-discrepancy theory.

Second, as a form of wishful thinking, aging ideals do not need to be feasible. Younger ideal ages will not be reached again and ideal life expectancies can crucially extend personal anticipations of the length of life as well as scientific realities and prognoses. An individual can state an ideal life expectancy of 120 years, despite it being highly unrealistic from both a personal and a scientific point of view. Ideal life expectancies which are perceived as unfeasible can thus have the character of longings

(see theory of life-longings; Scheibe et al., 2007) and could reflect the wish for more time in life, or the wish for a different and less burdened aging process. As such, ideal life expectancies could be stable desires despite being unrealistic and unfeasible (cf. Scheibe et al., 2007).

Table 1.1

Definitions of Ideal Life Expectancy, Perceived Life Expectancy, and Subjective Life Expectancy Discordance in Relation to Self-Discrepancy Theory

Construct	Definition	Operationalization	Relation to Self-Discrepancy Theory
Ideal Life Expectancy	Personal desire regarding the length of one's life	"To what age would you like to live?"	Self-related ideal
Perceived Life Expectancy	Subjective anticipation of the length of life	"To what age do you expect to live?"	Self-perception and self-related anticipation
Subjective Life Expectancy Discordance	Subjective state of discordance or concordance between self-related ideals and anticipations regarding the length of life	Δ = perceived life expectancy – ideal life expectancy	Discrepancy between self-related ideals and self-perceptions/ anticipations

Third, self-related aging ideals can be assumed to come with consequences, particularly in the affective and behavioral domain. Self-related aging ideals that are highly discordant from aging self-perceptions and anticipations of the future aging process would likely result in a lower psychological well-being. Also, ideals and longings are assumed to guide individuals and might thus affect their behavior. Individuals could for example try to overcome the discrepancy between their ideal and perceived life expectancy (= subjective life expectancy discordance) by engaging in a more healthy lifestyle.

So far, there has been little theoretical reasoning and overall research on self-related aging ideals. Self-discrepancy theory and the theory of life-longings thus provide a starting point for research questions and hypotheses surrounding ideal life expectancies. The three claims made above are addressed and expanded in Lang & Rupprecht (2019, Paper #1) as well as Rupprecht & Lang (2020, Paper #2).

Research Model

Based on this initial theoretical background, a research model including determinants, processes, and consequences of the construct of ideal life expectancy was

built for this dissertation. The research model is depicted in Figure 1.1 and introduces contexts and experiences of the individual, as well as personal belief systems and mindsets as potential determinants of ideal life expectancies.

Figure 1.1

Illustration of the Research Model

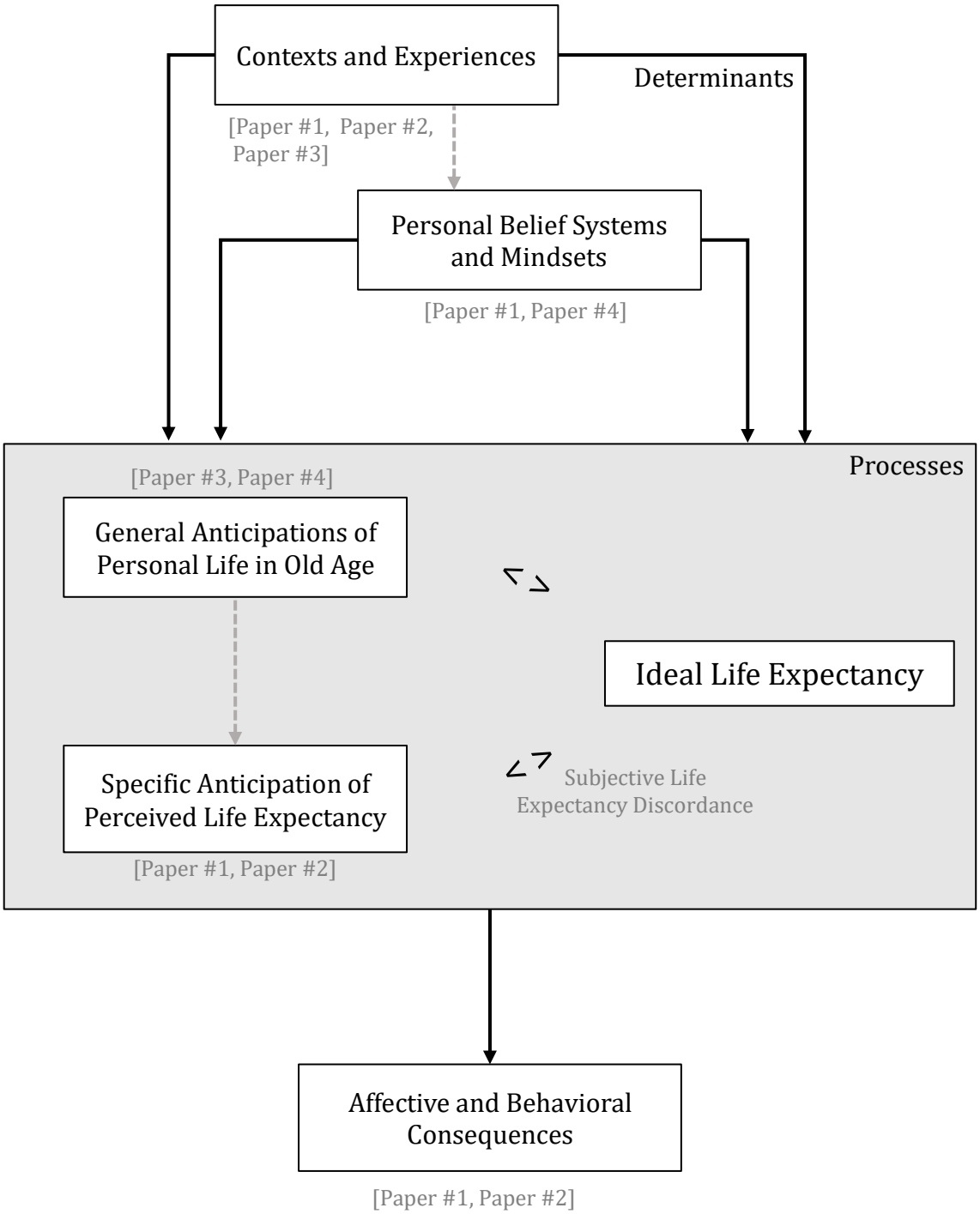

Figure 1.1 furthermore illustrates the processes likely surrounding the formation of personal ideal life expectancies. Following the process of anticipation, processes of evaluation and contrasting should take place (depicted as '< >' within Figure 1.1): Is the anticipated aging process considered ideal or less than ideal? Is the perceived life expectancy ideal or would one wish for an alternate ideal life expectancy? The already introduced construct of subjective life expectancy discordance (see Table 1.1) is seen as a result of such processes of anticipation, evaluation, and contrasting. Lastly, following the theoretical models of self-discrepancy theory (Higgins, 1987) and the theory of life-longings (Scheibe et al., 2007), it is assumed that ideal life expectancy and subjective life expectancy discordances come with affective and behavioral consequences (see Figure 1.1). In the following sections, potential determinants, processes, and consequences of ideal life expectancies are introduced and elaborated on in greater detail.

Determinants of Ideal Life Expectancy

Previous research has already established ideal life expectancy as an individual difference variable (Bowen et al., 2020; Bowen & Skirbekk, 2017; Cicirelli, 2002; Lang et al., 2007; Kalish & Reynolds, 1976). Average ideal life expectancies in Western countries lie in the late eighties or early nineties (Ambrosi-Randić et al., 2018; Bowen et al., 2020; Chopik et al., 2018; Lang et al., 2007). Interindividual variances in ideal life expectancies are however large (Bowen et al., 2020; Lang et al., 2007), indicating that some individuals wish for much longer lives, whereas others wish for much shorter lives. Moreover, whereas some individuals might consider their perceived life expectancies ideal, others would like to live much longer than they anticipate. A central research aim of this dissertation was thus the identification of determinants of such individual differences in ideal life expectancies. In the scope of this dissertation, two classes of determinants are distinguished. The first class comprises *contexts and experiences* as determinants of ideal life expectancy. The second class comprises *personal belief systems and mindsets* as determinants of ideal life expectancy. Contexts and experiences are hereby assumed to influence personal belief systems and mindsets.

Contexts and Experiences

Contexts summarize "the totality of the diverse range of phenomena, events, and forces that exist outside of the developing individual" (Dannefer, 1992, p. 84). The contexts individuals are living in are assumed to crucially shape the personal

development (Wahl & Gerstorf, 2018). They should serve as a starting and reference point for individual anticipations of the future as well as self-related ideals (Awang et al., 2020; Griffin et al., 2013; Hornsey et al., 2018; Lang et al., 2007). Experiences are collected within these contexts; they can be elicited by the contexts and by the individuals themselves. Just as broader contexts, personal experiences might inform an individual about what to expect and what to wish for in the future (Brandão et al., 2019; Kornadt et al., 2017). In the following, the dual source model (Lang et al., 2007) is presented to highlight the role of contexts and experiences for ideal life expectancies. Additionally, it is discussed how demographics and resources might shape and determine ideal life expectancies. Lastly, the context of the current coronavirus pandemic and its potential influence on ideal life expectancies is highlighted.

Dual Source Model

The dual source model (Lang et al., 2007) is a preliminary information-theoretical model, which assumes that anticipations of old age and ideal life expectancies are shaped by two broad sources of information: The scientific-societal knowledge an individual has about the aging process and longevity in general, as well as the experiential knowledge on aging gathered through personal and vicarious aging experiences. Scientific-societal knowledge on aging can stem from education, exposure to the media, and one's overall cultural and societal contexts. Individuals should hereby be exposed to different contexts and sources and might additionally express different extents of interest and responsiveness to such sources (Lang et al., 2007). An interesting example for the influence of specific scientific-societal contexts and knowledge comes from a study by Tausen and colleagues (2020). In comparison to a student sample and an adult sample recruited via Amazon Mechanical Turk, a sample of life-extension supporters recruited at the Undoing Aging Conference in 2018 considered extended life spans as more likely and as more ethically appropriate. Life-extension supporters also imagined themselves at extended ages more positively and with a greater sense of self-continuity. Additionally, there was an obvious tendency for the live-extension supporters to report higher ideal life expectancies—although absurdly high individual answers extending 1000 years of age, did not allow for meaningful statistical comparisons. In this case, the exposure to the very specific scientific-societal knowledge disseminated at the Undoing Aging Conference and similar events might have contributed to individual ideas and ideals regarding longevity.

The experiential knowledge individuals gather throughout the aging process should be of even stronger relevance for ideal life expectancy (Lang et al., 2007). When individuals decide about their ideal life expectancy, they likely anticipate and imagine their future aging process and future life in order to decide about its acceptability and desirability. For this, they need to rely on personal aging experiences already made. The *constructive episodic simulation hypothesis* (Ingvar, 1985; Schacter & Addis, 2007; Schacter et al., 2007) states that individuals draw on their own past experiences to imagine their future experiences and that remembering one's past and imagining one's future rely on shared cognitive and neurological processes. For example, when individuals imagine the health problems, disabilities, and dependency they might anticipate for their life in very old age, they likely draw from their own past and present experiences with various health events and health states ranging from single incidents (e.g., a broken femur) to chronic diseases (e.g., arthritis).

In regard to ideal life expectancy, research shows quite consistent relationships between the current health state and the ages individuals would like to reach. Particularly, individuals who rate their current health as worse present lower ideal life expectancies (Ambrosi-Randić et al., 2018; Bowen et al., 2020; Bowen & Skirbekk, 2017; Karppinen et al., 2012; Karppinen et al., 2016; Lang et al., 2007). In qualitative research, this trend of referencing the current health state for longevity desires is present as well (Brandão et al., 2019; Ekerdt et al., 2017; Karppinen et al., 2016). Relatedly, Uotinen and colleagues (2003) found that older adults reporting a healthy aging process (i.e., no or only minor health problems imposing daily life and hobbies, good self-rated cognitive functioning, good self-rated age-comparative functional capacity, and no signs of depression) were more likely to wish to reach 100 years of age than individuals reporting serious health issues and limitations. The role of (self-rated) health is further elaborated on in Lang and Rupprecht (2019, Paper #1).

Apart from personal aging experiences, individuals collect vicarious aging experiences by witnessing the aging of (close) others (Jopp et al., 2017). Brandão and colleagues (2019) specifically investigated the role of vicarious aging experiences for ideal life expectancy by asking close family members (the majority of them also the caregivers) of centenarians whether they would like to experience the age of 100 years themselves. In comparison with similar other studies (Huohvanainen et al., 2012; Karppinen et al., 2016), Brandão and colleagues (2019) found clearly more favorable

attitudes towards living a very long life in their exclusive sample of centenarians' family members. The authors concluded that the close relationship and the vicarious aging experiences made through the day-to-day contact with the centenarian did indeed affect participants' ideal life expectancies. Making positive as well as negative vicarious aging experiences by witnessing the aging process of (close) others might thus influence the anticipation of one's own old age as well as ideal life expectancies. Particularly younger adults who may not yet have many aging experiences themselves might rely on vicarious aging experiences through their older family members. However, there is likely a strong awareness that vicarious aging experiences are bound to contexts (cf. Jopp et al., 2017), that as times change so does aging, and that the aging experiences of one's own generation could be vastly different from the aging experiences of generations before (cf. Jönson, 2012). The dual-source model (Lang et al., 2007) would thus suggest that scientific-societal knowledge on the aging process as well as (personal and vicarious) aging experiences are gathered within the contexts of aging individuals and can determine and shape personal ideal life expectancies.

Demographics

Demographics like age, gender, and cultural background reflect and determine the contexts individuals are living in. Additionally, they crucially influence the experiences individuals make throughout their lives. By doing so they should influence individuals' ideal life expectancies directly as well as indirectly via the shaping of personal belief systems and mindsets. Starting with gender and sex, women and men have different objective and subjective outlooks on the aging process (Kornadt et al., 2013; Oksuzyan et al., 2008). Despite having lower statistical life expectancies than women, men seem to desire longer lives (Bowen et al., 2020). One reason for this could lie in differing social roles and approaches to the end of life (Arber et al., 2008).

The cultural background of an individual also influences views on aging (Voss et al., 2018) as well as personal belief systems and mindsets. For example, Hornsey and colleagues (2018) found that individuals from non-holistic cultures and regions (e.g., United States of America and Australia) maximized various ideals, among them their ideal life expectancy. In contrast, individuals from holistic cultures (e.g., Hong Kong and India), in which contradiction, change, and context are valued, were more moderate with their ideals and set ceilings to them, including their ideal life expectancies. The role of culture is expanded in Lang and Rupprecht (2019, Paper #1).

Chronological age should influence ideal life expectancy in multiple ways. As individuals grow older, they collect more aging and life experiences to draw from when imagining their future aging process (cf. Dual Source Model; Lang et al., 2007). They also construe an increasingly close rather than distant future when anticipating and imagining the end of life. Anticipations of the aging process could thus become clearer and more sophisticated as individuals age (Heckhausen, 1989; also see *construal level theory*, Trope & Liberman, 2010). When individuals come particularly close to or even reach their personal ideal life expectancies, it should be necessary to adapt them. An older age might also come with consequences for the discrepancy between ideal life expectancy and perceived life expectancy (= subjective life expectancy discordance): Older adults are known to be more realistic in their anticipation of the future (Lachman et al., 2008; Lang et al., 2013) and more accepting of various states, whereas younger adults tend to favor alternate states and hold ideals exceeding self-perceptions (Ryff, 1991; Scheibe et al., 2013). The perceived and ideal life expectancies of older adults might thus align more closely. Lastly, older adults might also react differently to comparable experiences than younger adults, a reasoning that is further explored in the general discussion of this dissertation. Overall, the role of chronological age for ideal life expectancies is considered in-depth in Rupprecht and Lang (2020, Paper #2) and Lang and Rupprecht (2019, Paper #1).

Resources

Resources available to the individual can arise from contexts (e.g., professional nursing care or social support) or the individual's immediate characteristics and might as such influence personal ideal life expectancies. In their review on subjective aging and awareness of aging, Diehl and colleagues (2014) identified two broad classes of resources relevant for the (subjective) aging process: First, socio-economic resources such as socio-economic status, education, financial and material assets, or access to health care. Second, psychological resources such as self-efficacy, coping styles, mastery, emotion regulation and personality. A third class of resources that becomes particularly evident in the qualitative studies on ideal life expectancies (Brandão et al., 2019; Ekerdt et al., 2017; Karppinen et al., 2016) is social resources such as close relationships with others, and the belief that someone trusted would care for oneself in old age.

The availability of resources should inform individuals about their ability to handle certain situations and anticipations of old age and might thus decide whether individuals

deem these anticipations desirable or even just manageable. For example, chronically ill older adults with a stronger sense of mastery expressed the wish to continue living for more years than individuals with a weaker sense of mastery (Lawton et al., 1999). Relatedly, older adults perceiving more personal control over their own health expressed more favorable attitudes towards an exceptionally long life (Cicirelli, 2011). Lastly, in a study by Brandão and colleagues (2019), a third of the participants who did not wish to live for 100 years explained this preference with the inexistence or unavailability of family caregivers.

Contextual Influences of the Coronavirus Pandemic

During the current coronavirus pandemic, individuals likely gather new scientific-societal as well as experiential knowledge on the aging process. Concerning the former, various scientific-societal sources have been informing specifically and repeatedly about the heightened risk associated with old age when it comes to the virus (Ayalon et al., 2020; Jimenez-Sotomayor et al., 2020). Additionally, older adults have been portrayed as frail, lonely, and in special need of protection (cf. Cohn-Schwartz & Ayalon, 2020). In regard to the experiential side, many individuals have been reminded of the fragility of life and have experienced a certain extent of vulnerability caused by the threat of the virus. This experience of vulnerability might make the aging process more salient. Additionally, the coronavirus pandemic has come with financial and social restrictions and could thus have resulted in shrinking socioeconomic, social, and psychological resources on the individual level. All these pandemic-related contextual developments could contribute to changes in ideal life expectancies. In Rupprecht, Martin, Kamin, & Lang (2021, Paper #3), ideal life expectancies are investigated and related to experiences within the coronavirus pandemic.

Personal Belief Systems and Mindsets

The contexts and experiences of an individual likely stimulate different personal belief systems and mindsets. Such belief systems and mindsets reflect an individuals' active consideration of topics such as living, aging, and death. They should influence the ways in which individuals approach old age and the finitude of life, and the life expectancy they consider ideal. In the following paragraphs, such personal belief systems and mindsets are discussed. This elaboration is expanded in Lang and Rupprecht (2019, Paper

#1) as well as Rupprecht, Martin, & Lang (2021, Paper #4) and is referred to in Rupprecht, Martin, Kamin, & Lang (2021, Paper #3).

Views on Aging

Views on aging reflect individuals' conceptions of age, aging, and aged individuals (Kornadt et al., 2020). A prominent class of views on aging are age stereotypes, which are learned early on in life, can be positive as well as negative, and are domain-specific, that is, they refer to distinct life domains such as health or social embeddedness (Kornadt & Rothermund, 2011; Levy, 2009). Whereas age stereotypes tend to be positive for some domains such as family and spirituality (Kornadt & Rothermund, 2011), they are overall prevailingly negative (Kite et al., 2005; North & Fiske, 2015). Age stereotypes influence individual anticipations of life in old age (Kornadt et al., 2012) and likely influence how desirable life in old age is perceived overall. How immediately specific age stereotypes could influence ideal life expectancies was shown in two studies by Levy and colleagues (2000), and Marques and colleagues (2014): Older adults subliminally primed with negative as opposed to positive age stereotypes expressed a weaker will to live across different hypothetical health scenarios. This was not the case for younger adults who were primed in the same ways.

In addition to the age stereotypes individuals hold, other beliefs about the aging process should also relate to ideal life expectancy. The belief that aging is inevitably and inherently linked to disease and decline (cf. *essentialism*; Weiss et al., 2016) is for example regularly expressed when individuals explain why they would like to die rather early (Brandão et al., 2019; Karppinen et al., 2016; van Wijngarden et al., 2017) and lies at the core of anti-aging and life-prolonging research (de Grey, 2013). Particularly for older adults, views on the aging process are of high self relevance and likely become embodied within the self-concept as individuals age (i.e., *stereotype embodiment or internalization*; Kornadt et al., 2017; Levy, 2009). They should thus directly influence anticipations of the aging process, the ideal life expectancy, as well as ultimately, the will-to-live.

Another component of views on aging that could be relevant for ideal life expectancies are other self-related aging ideals. Rupprecht and Lang (2020, Paper #2) investigated the relation between ideal age (i.e., the age an individual would currently wish to be) and ideal life expectancy. More specifically, the two self-related aging ideals were contrasted with self-perceptions and anticipations of aging and the association

between the resulting discordances was explored (see again Table 1.1). The two discordances of wishing to be younger than one feels (= subjective age discordance) and wishing to live longer than one anticipates to (= subjective life expectancy discordance) might hereby both reflect a dissatisfaction with the aging process, the passing of time, and the finitude of life. When it comes to views on aging, it might hence not only be a simplified relation between more positive views on aging and the wish for a longer life, but a more complex relation between what individuals associate with the aging process and what they would wish for.

Views on Death

When individuals decide about their ideal life expectancy, they need to contemplate and confront both living and aging, as well as death and the prospect of mortality. This connection to mortality is best understood when looking at the lower and upper range of ideal life expectancies. Wishing for a very short life or for a life hardly longer than the one already lived (e.g., Ekerdt et al., 2017) presumably reflects an absence of motivation for a prolonged life; it reflects a large acceptance of mortality and maybe also a weariness of life. In contrast, wishing for an extremely long life or to live indefinitely (e.g., Cicirelli, 2011; Lifshin et al., 2018) reflects a disregard and wishful distancing from one's own mortality. Between these extremes lies the majority of ideal life expectancies which warrant some kind of confrontation with mortality as well and should be related to individual views on death.

Death is naturally the biggest threat to human life and is assumed to be one of its most powerful motivators (Becker, 1973). Terror management theory assumes that humans react to the distal threat of death by reinforcing their self-esteem and cultural worldview (Greenberg et al., 1997). Such reinforcements of oneself and one's believes allow humans to feel significant and grant either literal immortality when the respective believes promise a life after death or symbolic immortality as believes and culture might live on (McCoy et al., 2000; Greenberg et al., 1997; Scott et al., 2021). Recent research also links *terror management theory* to the support for indefinite life extension (Lifshin et al., 2018; Lifshin et al., 2019). Namely, after a mortality salience intervention, non-religious (but not religious) individuals expressed more positive attitudes towards indefinite life extension (Lifshin et al., 2018). Individuals being confronted and threatened by death might thus not only strive for symbolic and literal immortality through a life after death

(cf. Greenberg et al., 1997), but also for immortality in its most immediate meaning—that is for extending human life as long as possible.

Proximal defense mechanisms against death are activated when its threat is not distant and subconsicous, but comes to the forefront and consciousness (Greenberg et al., 2000; Pyszczynski et al., 1999). This proximal defense can consist of an active suppression of death-related thoughts (Pyszczynski et al., 1999). It can however also consist of denying one's vulnerability and of pushing death into the distant future (Greenberg et al., 2000; Pyszczynski et al., 1999). Consequently, individuals who feel threatened by the thought of death activated by thinking about their ideal life expectancy might push death into the distant future and wish for a particularly long life. Tentative empirical evidence for this assumption comes from two studies by Carmel and Mutran (1997) and Carmel (2001): When confronted with different health scenarios and the prospect of death, individuals with a stronger fear of death presented a stronger will-to-live, more pronounced wishes to prolong life, and opted for hypothetical life-sustaining treatment with a higher probability. Additionally, fear of death was related to a stronger subjective life expectancy discordance in a study by Cicirelli (2006). That is, individuals afraid of death wished to live clearly longer than they anticipated to.

Whereas individuals who fear death might wish for particularly long lives, individuals accepting of death might be more content with shorter lives. Wong and colleagues (1994) identified three types of death acceptance: *Neutral acceptance* describes the acceptance of death as an integral and unchangeable part of life. *Approach acceptance* is associated with the belief in a happy afterlife one is looking forward to. Lastly, *escape acceptance* occurs when death is a welcome alternative to a life full of suffering. In a study by Ballinger and colleagues (2017), approach and escape acceptance (but not neutral acceptance) were both related to lower desires for life extension up to 150 years and indefinite life extension. Both acceptances were however unrelated to desires for life extension up to 100 years. Similarly, aspects of religiosity, which are related to positive afterlife beliefs, greater death acceptance and less fear of death (e.g., Ballinger et al., 2017; Ellis et al., 2013; Harding et al., 2005), were associated with less endorsement of extreme and indefinite life extension (Ballinger et al., 2017; Cicirelli, 2011; Lifshin et al., 2018; Lifshin et al., 2019). Religiosity was however unrelated or even positively related to valuation of life, will-to-live, and the wish to prolong life with available life-sustaining treatments in various studies (Carmel, 2001; Carmel & Mutran,

1997; Randall & Bishop, 2013; Rietjens et al., 2005). Whereas religiosity and a higher death acceptance thus seem related to a weaker desire to live extremely long or indefinitely, they seem rather unrelated to the life expectancy individuals would prefer in the scope of what is as of yet possible and realistic. Lang & Rupprecht (2019, Paper #1), Rupprecht, Martin, Kamin, & Lang (2021, Paper #3), Rupprecht, Martin, & Lang (2021, Paper #4) elaborate on views on death in relation to ideal life expectancy and specifically investigate the role of fear of death and (neutral) death acceptance.

Essentialist, Medicalist, and Stoicist Mindsets

Views on aging, views on death, and other influencing factors (i.e., contexts and experiences) likely culminate in the formation of mindsets regarding the aging process. Lang & Rupprecht (2019, Paper #1) describe how different personal belief systems regarding living, aging, and death, could be combined into three common (but not exclusive) mindsets for longevity motivation, that is, an *essentialist*, a *medicalist*, and a *stoicist* mindset. The *essentialist mindset* views aging as a pathological process that is inherently linked to decline and defined by biology (Weiss, 2018; Weiss et al., 2016). Within an essentialist mindset, aging is seen as deficient and as the precedent of death. Individuals holding a predominantly essentialist mindset might wish to halten the aging process. More extremely, they might wish to overcome aging and dying altogether and to strive for an *infinite life*. This could result in wishes for—as of now—unrealistically long lives. Just as the desire for exceptional life durations, the affirmation of essentialist views on the length of life is indeed present in the population, but only for a small group of individuals (Cicirelli, 2011; Donner et al., 2016; Dragojlovic, 2013; Lifshin et al., 2019; Partridge et al., 2010).

The *medicalist mindset* views aging only as burdened when pathology occurs. Individuals holding a predominantly medicalist mindset strive for a *healthy life* and healthy aging process. Medicalist mindsets become apparent in longevity desires contingent on health (Brandão et al., 2019; Ekerdt et al., 2017; Karppinen et al., 2016), in preferences for a shorter life in good health over a longer life in restricted health (Ayalon & King-Kallimanis, 2010; Rietjens et al., 2005), as well as in common desires to not continue living under adverse health conditions (Carmel & Mutran, 1997; Lawton et al., 1999). As serious health issues are often anticipated for life in very old age, a medicalist mindset could be associated with lower ideal life expectancies and—in its more extreme forms—the wish to die before reaching very old age and one's perceived life expectancy.

The *stoicist mindset* is a mindset of acceptance and comes with the strive and prospect to live a good and *dignified life* despite the vulnerability and loss that may come with old age. Individuals holding a predominantly stoicist mindset might be accepting of their perceived life expectancy or would maybe like to live some years longer, trusting in their ability to cope with the challenges and risks of a long life by preserving meaning and dignity. As such, the stoicist mindset might be close to a strong valuation of life, as researched by Lawton and colleagues (1999; 2001). The construct *valuation of life* captures aspects of futurity, hope, self-efficacy, persistence, and purpose (Lawton et al., 2001). A stronger valuation of life was associated with a higher number of years older adults would like to live under different hypothetical health scenarios (e.g., no limitations, in severe pain, with severe physical and/or cognitive limitations; Lawton et al., 1999; Lawton et al., 2001). Lawton and colleagues (2001) argued that the valuation of life hereby reflects a motivation to live despite health restrictions and adversity.

Taken together, views on aging, views on death, and other beliefs of an individual (e.g., religiosity) build personal belief systems relevant for ideal life expectancies. Such personal belief systems can be summarized in the form of mindsets towards the aging process and longevity. Essentialist, medicalist, and stoicist mindsets are examples of such overall approaches toward the aging process, which should serve as determinants for ideal life expectancies.

Processes behind Ideal Life Expectancies

After the main determinants of ideal life expectancies have been derived, the next section will focus on processes that underlie the formation of ideal life expectancies. Whereas determinants likely preceed and influence ideal life expectancies, processes refer to the immediate formation of ideal life expectancies. Specifically, processes of anticipation, evaluation, and contrasting should take place when individuals form their ideal life expectancies. The reliance on anticipations of the personal future (aging process) is particularly important as ideal life expectancies refer to a distant and mostly unforeseeable future. Such personal anticipations can then be evaluated as positive, negative, or ambivalent, and individuals can decide whether they look forward to these anticipations, are accepting of them, or whether they see them as disconcerting or even threatening. Lastly, they might form ideal life expectancies in concordance or discordance with their anticipations. Particularly in relation to perceived life expectancies, individuals

can actively form discordant and contrasting ideal life expectancies (see section on *Theoretical Background on Self-Related Ideals*). At first, general anticipations of one's personal old age and future and their relations to ideal life expectancies are discussed. In a second step, the specific anticipation that is perceived life expectancy will be established as a background against which ideal life expectancies are formed.

Anticipations of Old Age as a Background for Ideal Life Expectancies

In a now classic work by Heckhausen and colleagues (1989), adult lifespan participants were asked to rate whether various attributes such as *experienced*, *forgetful*, and *calm* increase across the lifespan, between which ages they increase, and whether the respective increase is desirable or undesirable. Participants of all ages anticipated undesirable change—that is, losses—to accumulate in older ages. They also anticipated desirable change—that is, gains—to lessen as individuals get older. Importantly though, participants anticipated the presence of both gains and losses across the entire lifespan, including very old age. Research on age stereotypes paints a similar picture of prevailingly negative views on old age, older adults, and aging (Kite et al., 2005; North & Fiske, 2015). How individuals view and anticipate aging in general, is also related to how they anticipate their personal future (Rothermund, 2005). Kornadt et al. (2012) found a domain-specific relation between age stereotypes and future self-views as an aged person. For example, individuals who generally viewed older adults as more positive in the domain of friendship and acquaintances also tended to anticipate this domain more positively for their own life in old age. Similarly, the somewhat more hypothetical feared-for and hoped-for future selves of older adults seem tainted by individual age stereotypes in the areas of physical health and cognition (Dark-Freudeman et al., 2006; Hooker & Kaus, 1994). Age stereotypes and general views on aging hereby already influence how children anticipate themselves in old age (Lloyd et al., 2018).

As individuals grow older, they additionally make their own experiences with the aging process, and build aging-related self-perceptions (cf. Diehl et al., 2014). Those experiences and perceptions should enrich individuals' anticipations of their own future as well. Research shows that aging experiences can shape possible future selves (Frazier et al., 2002): Older individuals and those reporting worse physical functioning and more physical limitations were more likely to report anticipations in form of possible selves in the health domain. In a more general sense, a stronger awareness of age-related losses in one's own aging process was associated with a more limited future time perspective in

studies by Brothers and colleagues (2016), Dutt and Wahl (2019), as well as Wilton-Harding and Windsor (2021). Taken together, individuals of all ages seem to hold anticipations of their own old age, which are influenced by individual views on aging as well personal aging experiences.

After these anticipations of the personal old age are formed, they can be evaluated by the individual and used as a background for the formation of ideal life expectancies. Recent research shows that general as well as personal anticipations of old age are indeed related to the ideal life expectancies of younger and middle-aged adults (Awang et al., 2020; Bowen et al., 2020; Bowen & Skirbekk, 2017). Bowen and colleagues (2020) investigated the role of general anticipations of old age for ideal life expectancy. They found that positive representations of old age (e.g., as a time of wisdom and contentment) relate to higher ideal life expectancies, whereas negative representations of old age (e.g., as a time of illness and loneliness) relate to lower ideal life expectancies (Bowen et al., 2020). In the studies by Bowen & Skirbekk (2017) and Awang et al. (2020), having concrete positive anticipations for one's own life in old age (e.g., having more time for one's hobbies) was related to wishing for a longer life, whereas having concrete negative anticipations (e.g., developing Alzheimer's disease) was related to wishing for a shorter life.

Apart from such explicitly aging-related anticipations, the future time perspectives of individuals should also carry information important for individual ideal life expectancies. Influenced by past and current aging experiences (cf. Brothers et al., 2016) but also more general views on aging (e.g., as a process of inevitable decline; Weiss et al., 2016), individuals' future time perspectives entail aspects such as perceived future opportunities, constraints, and extension (Rohr et al., 2017). The anticipation of a limited and constrained old age and future, bare of appealing opportunities may discourage individuals from wishing for a particularly long life. In contrast, the anticipation of further opportunities and an overall open future could contribute to the wish for a longer life also among very old individuals. In Rupprecht, Martin, Kamin, & Lang (2021, Paper #3), this association between ideal life expectancy and anticipations of future time opportunity, extension, and constraint is explored in a short-term longitudinal study.

Anticipations of old age and the future are clearly multifaceted and complex (Kornadt et al., 2012; Kornadt et al., 2019). For example, individuals' can hold distinct

anticipations for life at certain ages, which could stimulate the wish to reach a specific age but to not live longer than that. The vast majority of individuals would like to experience early old age or *third age*, an age period often anticipated as desirable and filled with activity and self-determination (see Baltes & Smith, 2003). Fewer individuals would however like to experience a very old age or *fourth age*, which is anticipated much more ambivalently and often as a time of heightened vulnerability, illness, and dependency (Baltes & Smith, 2003; Lang et al., 2007). Two qualitative studies by Karppinen and colleagues (2016) as well as Brandão and colleagues (2020) support this notion of distinct anticipations for life in very old age. In these studies, older adult participants were asked whether and why they would or would not like to reach 100 years of age. Anticipations of disability and diseases, loneliness, and dependency specifically for such a high age were among the main reasons for individuals to not wish to live to the age of 100 years.

Anticipations of oneself in the future can also be different and distinct for certain domains and aspects of life (Kornadt et al., 2012). For example, individuals might anticipate their life in old age positively in regard to social relationships, but negatively in regard to their physical health. Individuals might thus look forward to certain aspects of old age, but wish to avoid others. This becomes evident in the conditional longevity desires often found in qualitative research (Brandão et al., 2019; Ekerdt et al., 2017; Karppinen et al., 2016): Individuals would like to live a long life, but only when some of their worse anticipations and fears will not become reality. They would for example like to reach 100 years, but only if they were healthy, socially integrated, or not a burden to others (Brandão et al., 2019; Karppinen et al., 2016). Specific negative anticipations—particularly in the health domain—thus seem to dampen individual longevity desires.

In Rupprecht, Martin, & Lang (2021, Paper #4), aging-related fears were investigated as specific anticipations of the aging process in relation to ideal life expectancies. Aging-related fears constitute negatively evaluated anticipations of the aging process. As such, aging-related fears are often stated as individual reasons against the wish for a long life (Karppinen et al., 2016). If aging-related fears become associated with one's life in the future, this future life can become a source of dread and anxiety. One consequence might be that individuals desire to avoid this life, or as Bowen and Skirbekk (2017, p. 1900) put it: "[…] the fear of living under certain conditions may sometimes be stronger than the fear of death." In this vein, Rupprecht, Martin, & Lang (2021, Paper #4) investigated the fear of aging-related diseases and the fear of loneliness in old age. As

personal anticipations of old age likely build the background against which individuals choose their ideal life expectancy, threatening anticipations of the future might be associated with weaker desires to live a very long life—or even with the active preference to not reach very old age at all.

Importantly though, the same or similar anticipations might have different consequences for different individuals—for example, depending on an individual's resources, as well as personal belief systems and mindsets. When confronted with different and oftentimes threatening hypothetical health scenarios, individuals with a stronger valuation of life (Lawton et al., 1999; Lawton et al., 2001) or a stronger fear of death (Carmel, 2001; Carmel & Mutran, 1997) expressed a stronger endorsement of life-prolonging treatment and an overall stronger will-to-live despite adverse anticipations. The contexts, resources, and belief systems of individuals might thus impact how anticipations of old age are evaluated. In Rupprecht, Martin, & Lang (2021, Paper #4), fear of death was investigated as a moderator of fear of aging-related diseases and fear of loneliness in old age, assuming that only for some individuals aging-related fears might actually be strong enough to stimulate the wish for an earlier death and the preference to avoid very old age completely.

Perceived Life Expectancies as a Background for Ideal Life Expectancies

The anticipation of one's future aging process entails various aspects of life and living, among them the difficult and very specific anticipation of when life will come to an end. Anticipations of the length of life have been investigated in form of subjective survival probabilities (Smith et al., 2001), subjective nearness-to-death (Palgi et al., 2019), as well as perceived life expectancies (also referred to as subjective life expectancies; Griffin et al., 2013). Perceived life expectancies are often surprisingly close to reality (Hurd & McGarry, 2002; Kotter-Grühn et al., 2010; Smith et al., 2001; van Solinge & Henkens, 2018). Among individuals at the end of their life, the reason for this accuracy could lie in the ability to sense death coming closer (Kotter-Grühn et al., 2010). Another possible reason for the accuracy of perceived life expectancies seems to lie in their underlying rationality. Griffin and colleagues (2013; also see Palgi et al., 2019) showed that individuals consciously base their perceived life expectancies on biomedical and genetic factors (e.g., health diagnoses and parents' longevity), socioeconomic factors, psycho-social factors, as well as health behaviors—all of which are of high relevance for the actual

life expectancy of an individual. Accordingly, research shows that individuals adapt their perceived life expectancies following crucial changes in their lives, such as the (early) death of a parent or spouse, a cancer diagnosis, or more general health decline (Hurd & McGarry, 2002).

Despite the relatively accurate mental models behind perceived life expectancies (cf. Griffin et al., 2013), they can of course not fully cover the many eventualities of life and the overall complexity of the aging process. Particularly individuals far from the end of life are prone to under- and overestimations. For example, Bowen and colleagues (2020) found that most of their younger adult participants estimated their own life expectancy as clearly higher than the life expectancy of similar others of the same age and gender. Hereby, the participants presented a common and consistent bias found in human risk perceptions, that is, that unfortunate events such as an early death are seen as less likely for oneself than for similar others (i.e., optimism bias; Weinstein, 1980). As individuals however can and do not know their future, perceived life expectancies likely serve as their best guess when deliberating over the time at which one's life will come to an end. Consequently, perceived life expectancies serve as a background and anchor against which individuals approach their own aging, as well as choose, evaluate, and contrast their ideal life expectancies.

Following self-discrepancy theory, ideal life expectancies should oftentimes deviate from preceived life expectancies and exceed them (Higgins, 1987; Watson, 2016). Lang & Rupprecht (2019, Paper #1) and Rupprecht & Lang (2020, Paper #2) explored ideal and perceived life expectancies and the resulting states of concordance or discordance in subjective life expectancy (see Table 1.1). In accordance with prior and concurrent research (Ambrosi-Randić et al., 2018; Cicirelli, 2006; Bowen et al., 2020), ideal life expectancies were some years higher than perceived life expectancies on average. On average, individuals thus seemed to experience a moderate discordance between their ideal and perceived life expectancies and wished for some more years of life.

At first glance, this appears to be a positive finding in regard to how individuals approach (a distant) old age and the length of life. However, more extreme discordances between ideal and perceived life expectancies were also common (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2). Such strong discordances could stem from a rather low perceived life expectancy, for example due to personal illness, and

express an individual's desire for an alternate reality of growing old. Strong discordances could also arise from the ideal of an as of now unrealistically long life or the wish to overcome death completely. In both cases, the respective ideal life expectancies should be rather unattainable to the individual and might hence have the character of longings (cf. Scheibe et al., 2007).

Another crucial finding of our research was that around ten percent of the participants presented ideal life expectancies lower than the respective individual perceived life expectancies and thus experienced a *negative discordance* (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2). At least a subsample of individuals hence seems to anticipate those last years of life in such negative and threatening ways that they would wish to completely avoid them—a finding that will be highlighted again in the general discussion of this dissertation. Additionally, another subsample of individuals experienced concordance, that is, they considered their perceived life expectancies as ideal and had no strong desire to live longer or shorter lives. Such concordance could indicate a strong satisfaction or acceptance of the finitude of life as well as of one's anticipated aging process.

The discrepancy between ideal and perceived life expectancies could hypothetically also be approached from a different angle, that is, whether individuals anticipate that they can reach their ideal life expectancies, and whether they consider them as realistic or likely. Asked about the likelihood of their ideal life expectancies, individuals from a German lifespan sample (Lang et al., 2007) answered with an average of 6.2 (SD = 2.8) on a scale ranging from 0 (absolutely unlikely) to 10 (very likely). Irrespective of the angle of observation, individuals thus seem aware of their subjective concordance or discordance when it comes to the length of their lives. Ideal and perceived life expectancies should thus forge a meaningful discrepancy to each other, which is indicative of experiences of concordance and discordance when it comes to the future aging process and the length of life.

Apart from the comparison of average ideal and perceived life expectancies (Ambrosi-Randić et al., 2018; Bowen et al., 2020), individual subjective life expectancy discordances have rarely been been investigated in prior research (see however Cicirelli, 2006). Lang & Rupprecht (2019, Paper #1) and Rupprecht & Lang (2020, Paper #2)

investigated the presence, magnitude, and stability of subjective life expectancy discordance, that is, the discrepancy between ideal and perceived life expectancies.

Consequences of Ideal Life Expectancies

After introducing potential determinants of ideal life expectancies as well as potential processes of anticipation, evaluation, and contrasting that surround the formation of ideal life expectancies, the following section will elaborate on the consequences of ideal life expectancies and subjective life expectancy discordances.

Ideal life expectancies constitute wishes or desires for the personal future. As such, they can be an expression of satisfaction when concordant with individual perceived life expectancies. More often, individuals' ideal life expectancies are however desires for a future other than the one they anticipate. As such, individuals might actively try to bridge discordances between perceived and ideal life expectancy. They could however also despair in light of a self-related ideal they see as unattainable (cf. self-discrepancy theory; Higgins, 1987). Ideal life expectancies could thus come with various cognitive, affective, and behavioral consequences (e.g., goal-setting, changes to psychological well-being, and behavior change).

An important prerequisite for impactful and lasting cognitive, affective, and behavioral consequences of ideal life expectancies is their permanence and stability (cf. Dreisbach & Fröber, 2019; Höchli et al., 2018; Scheibe et al., 2007). If ideal life expectancies were just a fleeting desire or a number spontaneously chosen whenever individuals are provoked to answer the question of how long they would like to live, there could be immediate consequences but likely no lasting change. In contrast, following assumptions about the enduring determinants and processes behind it as well as the overall stability of self-related ideals (Scheibe et al., 2007; Strauman, 1996; Watson et al., 2016), ideal life expectancy is assumed to be relatively stable—particularly over the time span of several months and years which was applied in three of the included research papers (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3). Temporal stability of ideal life expectancies has not been empirically tested so far. However, two related constructs of ideal life expectancy, that is, the will-to-live, as well as preferences for life-sustaining treatment across various hypothetical illness scenarios exhibited considerable stability over the scope of two years (Carmel et al., 2018; Ditto et al., 2003).

The most obvious and central consequence of ideal life expectancies should be the actual length of life and survival of an individual, which three studies have so far (tangentially) addressed (Carmel et al., 2007; Huohvanainen et al., 2012; Karppinen et al., 2012). In a sample of older businessmen, three-year survival was higher among those wanting to reach 100 years of age compared with those who did not want to reach 100 years of age (Huohvanainen et al., 2012). In the scope of a cardiovascular prevention trial, higher ideal life expectancies of adults aged 75 to 90 years were positively related to 10-year survival after controlling for age, gender, education, comorbidity, cognitive functioning, and feelings of depression (Karppinen et al., 2012). Lastly, a stronger will-to-live was associated with 7.5 year survival only for older women but not for older men after controlling for age, self-rated health and other psychosocial variables (Carmel et al., 2007). Although these studies—particularly the one from Karppinen et al. (2012)—clearly emphasize the potential importance and impact of ideal life expectancies, the pathways for this association remain unclear, and should be highly complex and multidetermined.

One likely behavioral pathway could be the adaptation of a healthier lifestyle among those wishing to lead longer lives. Individuals seem well aware that different health and risk behaviors are associated with a higher life expectancy (Griffin et al., 2013). Individuals might thus think of various health behaviors such as physical activity, healthy nutrition, regular medical check-ups, or good sleep as ways to reach their ideal life expectancy. In a study by Bowen and colleagues (2020), young adults with ideal life expectancies between 80 and 100 years were indeed more physically active and presented a lower tobacco use than individuals with ideal life expectancies below 80 years. As the data were however cross-sectional, the causality behind this association could not be determined. In Lang & Rupprecht (2019, Paper #1) the relation between perceived life expectancy, ideal life expectancy, and health behavior change is briefly explored in a longitudinal sample.

Following self-discrepancy theory (Higgins, 1987) and the theory of life-longings (Scheibe et al., 2007), another important consequence of ideal life expectancies pertains to the psychological well-being of individuals. According to self-discrepancy theory, large self-discrepancies experienced within the aging process, such as a strong subjective life expectancy discordance, could lead to a lower psychological well-being. Similarly, the theory of life-longings proposes that longing for a longer life and a future one sees as

unattainable, could stimulate feelings of incompleteness, unhappiness, chronic loss, and despair (Mayser et al., 2008; Scheibe et al., 2007). In contrast, concordance between ideal and perceived life expectancies could be linked to a higher psychological well-being (cf. Barnett et al., 2017). In Rupprecht & Lang (2020, Paper #2), these consequences of ideal life expectancy and its discordance to perceived life expectancy were investigated for positive affect, negative affect, and life satisfaction as indicators of psychological well-being.

Summary of Research Questions

The four research papers integrated in this dissertation took different approaches on the topic of ideal life expectancy. An overview of their main foci regarding determinants, processes, and consequences of ideal life expectancies can be seen in Figure 1.1. The first paper (Lang & Rupprecht, 2019, Paper #1) summarized prior research and literature on longevity desires and derived three different mindsets for longevity motivation. It concluded in exploratory analyses testing some of the assumptions behind the three mindsets. As depicted in Figure 1.1, this first paper did cover many areas of the overall research model, from determinants to processes to consequences of ideal life expectancies. The second paper (Rupprecht & Lang, 2020, Paper #2) theoretically embedded the construct of ideal life expectancy and its discrepancy to perceived life expectancy in self-discrepancy theory and the theory of life-longings. It investigated subjective life expectancy discordance (perceived life expectancy – ideal life expectancy) in relation to chronological age, psychological well-being, as well as another self-discrepancy within the subjective aging process, that is, the discrepancy between perceived age and ideal age, labeled as *subjective age discordance*. By doing so, ideals (and discordances) regarding the anticipated aging process could be linked to ideals (and discordances) regarding the current aging process. As depicted in Figure 1.1, the second paper also simultaneously focused on determinants, processes, and consequences of ideal life expectancies.

The third research paper (Rupprecht et al., 2021a, Paper #3) explicitly focused on the influences of the coronavirus pandemic on ideal life expectancy, future time perspective and fear of death. This research allowed for testing assumptions of stability that underlie the construct of ideal life expectancy, the influence of varying contexts, and its associations with fear of death and anticipations of future time opportunity, future

time extension, and future time constraint during a pandemic. The main focus of the third paper hence lied on potential determinants and processes surrounding the formation of ideal life expectancies (see Figure 1.1). The fourth research paper (Rupprecht et al., 2021b, Paper #4) lastly focused on the role of fears regarding the aging process, that is, the fear of diseases and the fear of loneliness in old age for ideal life expectancies. Next to those two fears, it also targeted different mindsets regarding old age and death by investigating the role of fear of death. The main focus of the fourth paper thus lied on determinants and processes behind ideal life expectancies. In Table 1.2, the more specific research questions addressed in the four research papers are furthermore summarized. Findings will be summarized and synthesized in a general discussion after the four research papers have been presented.

Table 1.2

Research Questions Addressed in the Present Dissertation

Area of Research	Research Questions	Addressed in Publication
Contexts and Experiences	How is ideal life expectancy related to chronological age?	#1, #2, #3
	Is self-rated health related to ideal life expectancy?	#1, #2, #4
	Are there cultural differences in ideal life expectancy (and subjective life expectancy discordance)?	#1
	How are ideal life expectancies related to experiences as well as shrinking resources during the coronavirus pandemic?	#3
Personal Belief Systems and Mindsets	Which main motivational mindsets for longevity and ideal life expectancy can be identified?	#1
	Are fear of death and death acceptance related to ideal life expectancies?	#1, #3, #4
	Are ideals regarding the anticipated future aging process related to ideals regarding the current aging process? Is subjective life expectancy discordances related to subjective age discordance (= the discrepancy between ideal age and perceived age)?	#2

General Anticipations of Life in Old Age	Are aspects of an individual's future time perspective (i.e., future time opportunity, future time extension, future time constraint) related to ideal life expectancies?	#3
	Are fears regarding the aging process (i.e., the fear of aging-related diseases and the fear of loneliness in old age) as explicitly negative anticipations of old age associated with lower ideal life expectancies?	#4
	Does fear of death moderate the relationship between aging-related fears and ideal life expectancy?	#4
Specific Anticipation of Perceived Life Expectancy	Do individuals distinguish between the life expectancy they perceive for themselves and the life expectancy they wish for themselves? Do most individuals wish to live longer than they anticipate to?	#1, #2, #4
	Is subjective life expectancy discordance (=the discrepancy between perceived and ideal life expectancy) a meaningful and stable construct?	#1, #2
Consequences	Is the construct of ideal life expectancy related to health behavior change?	#1
	Is the construct of subjective life expectancy discordance related to psychological well-being?	#2

2

Motivation for Longevity Across the Lifespan: An Emerging Issue

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Invited Article

Motivation for Longevity Across the Life Span: An Emerging Issue

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Abstract

Over the past decades, increases in life expectancy in most modern societies have raised questions about whether and to what extent individuals value possible extensions of their personal lifetime. In this vein, a new field of research emerged that investigates the determinants, concomitants, and consequences of longevity values and personal preferences for an extended lifetime across adulthood. Based on a review of available theoretical and empirical work, we identified 3 mindsets on the challenges and potentials of human longevity common in research as well as personal views: (a) an *essentialist* mindset that builds on ideal principles of an infinite life, aimed at conquering or significantly postponing a biologically determined aging process, (b) a *medicalist* mindset that appraises aging as being primarily based on quality of health, and (c) a *stoicist* mindset that associates longevity and lifetime extension with the experience of grace and meaning. In this regard, we submit that motivation for longevity and its behavioral consequences differ depending on what mindsets individuals adopt in a given developmental context. We suggest that mindsets of longevity motivation are embedded in personal belief systems (e.g., death acceptance) that may depend on health, and on context influences (e.g., culture). Mindsets of longevity motivation may be related to differences in health behavior and late-life preparation. We illustrate such ideas with an exploratory analysis from a cross-cultural data set. We discuss the possible implications of these mindsets of longevity motivation for the aging sciences, and with regard to individual ways of approaching old age.

Translational Significance Contexts, personal beliefs, and functional health are thought to influence an individual's motivation for longevity. Identifying mindsets of motivation for longevity may help to better understand preparation for old age and individual decisions in the aging process and may provide an opportunity for future intervention.

Keywords: Attitudes about aging, Cross-cultural studies, End of life, Humanities, Life course/life span, Longevity motivation, Medicalism, Oldest old, Quality of life, Self-rated health

Longevity is both blessing and onus of the medical, technical, and social advances observed in most modern societies over the past century. There exist strong differences with regard to how individuals value the gains of additional years in life. In 1939, Piersol and Bortz were first to define an agenda for future gains in life expectancy, when they proclaimed that: "… *it is for science to add life to years and not years to life*" (p. 976). With this often-cited statement, Piersol and Bortz identified life quality and functional health as a key scope of biomedical aging research.

However, with an increasing number of people experiencing extended life spans, many also come to appreciate the potentials for positive life experiences in these added on years even when conditions are adverse. Thus, adding life to years cannot be viewed simply as a medical issue because the quality of a prolonged life also depends on cognitive, behavioral, psychological, and social processes. There is some evidence that individuals show considerable adaptivity and resilience to aversive circumstances in all phases of life (Bonanno, 2004; Brandtstädter, 1999). Moreover, there is strong agreement in gerontology that old age reflects what Paul Baltes and collaborators (e.g., P. B. Baltes & Smith, 2003) coined as an "…*incompleteness of the overall biogenetic architecture of the life course*" (P. B. Baltes & Smith, 2003, p. 131), which often involves vulnerability and risks (Butler, 1975; Kruse, 2017). Accordingly, in many demographic, epidemiologic, and large-scale studies, it has been shown that extensions of life expectancy were associated with gains in both healthy years and years lived with disability, chronic health conditions, or need of care (Hay et al., 2017). In this vein, the final phase of very old age is generally considered to involve challenges, loss, and decline (P. B. Baltes & Smith, 2003; Tesch-Römer & Wahl, 2017). One implication is that the task of aging may not be restricted to maintaining health and functioning, but also includes adaptational tasks such as coping with disability and care needs (M. Baltes, Wahl, & Reichert, 1991). In other words, aging may also involve the need to accept some kind of vulnerability. Consequently, psychological resilience to adverse life conditions may foster motivation for longevity from early adulthood until very late in life.

In this vein, a new field of research has emerged that investigates individual preferences and attitudes toward longevity and extensions of lifetime. In the following, we review and discuss previous research on longevity motivation (Lang, Baltes, & Wagner, 2007) and related concepts such as attitudes toward an extended lifetime (Cicirelli, 2011), valuation of life (Lawton et al., 1999), and will to live (Carmel, 2011). Existing research on longevity motivation has often focused on specific phases of the life span such as late life (Carmel, 2011), young and middle adulthood (Bowen & Skirbekk, 2017) or end-of-life (Cicirelli, 2011). We are not aware of an integrative theoretical life-span approach that includes different approaches to longevity motivation in a comprehensive life-span perspective. For example, it is not well understood whether longevity desires differ from health-related preferences in young, middle-aged, or old-aged adulthood. In what ways do individuals across adulthood differ with regard to the meaning, and the perceived value of longevity? What are age-related determinants and consequences of varying mindsets of longevity motivation?—We begin our considerations by giving an overview on existing research on longevity desires. Based on these findings we submit a heuristic model of longevity motivation. We conducted an exploratory pilot analysis using a cross-cultural study to illustrate some of the assumptions of this heuristic model. We conclude this review with a discussion of future research issues that can be derived from the proposed heuristic model of longevity motivation.

Desired and Expected Longevity

In general, individuals in modern societies differ with regard to how strongly they esteem possible extensions of their personal lifetime (Cicirelli, 2011; Lang et al., 2007; Ekerdt, Koss, Li, Münch, Lessenich, & Fung, 2017). For example, some individuals think of lifetime extensions merely as products of biomedical advances. Consequently, a person may believe that a prolonged lifetime is only acceptable for oneself as long as one experiences autonomy or health. Other individuals may think of their personal lifetime and late life as a task that they want to accomplish regardless of whether this also involves experience of loss. There exist several studies, in which individuals reported their personal longevity motivations, based on questions such as "*to what age would you like to live?*.", or "how long would you like to live?", all of which we consider to have equivalent connotations. Especially when considered in relation to personal longevity expectations (e.g., "*to what age do you expect to live?*") different mindsets become evident. For example, wanting to live as long as one expects reflects an acceptance of the finitude of one's personal life. A desire to live much longer than one expects to live may indicate a desire to overcome actual limits of life expectancy. A wish to live less long than one expects to live may imply a negative or deprecating attitude toward aging.

Table 1 gives an overview on distributions of findings that were identified in recent empirical studies. The table combines findings from studies that used either quantitative or qualitative methods to assess longevity preferences in diverse samples from different phases of the human life course. In general, findings are heterogeneous and vary depending on the respective study design, method, age composition, and cultural backgrounds. For example, Ekerdt and colleagues (2017) interviewed 90 older adults in three different cultures. About 37% expressed no wish of "having more time in life," either by directly expressing their desire for an end in the near future, or by referring to fate. About 48% of the respondents wished to live longer conditional on mental and physical health, and 15% expressed an unconditional wish to live longer. In the study of Karppinen and her colleagues (2016) individuals reported whether and why they would (not) "want to live to be 100?"—Out of the 1,405 older adults, one-third (32.9%) wanted to live to 100 years. Health was both a condition for wanting to reach 100 years (expressed by 45%) and a reason for not wanting to reach this age (expressed by 48%). Apart from this, 57% of the individuals wanting to reach 100 years expressed positive reasons for this such as curiosity or love for life. On the other side, 77% of the individuals not wanting to reach 100 years stated reasons expressing negative attitudes toward life in very old age. In a quantitative

Table 1. Measurement and Distribution of Longevity Desires: An Overview of Findings

Authors/sample	Sample items on longevity desire	Key findings
Lang and colleagues (2007)[a] *N* = 364 (Study 2), *M* = 52 years (20–92 years); 54% female	(1) What age would you like to reach? (2) How desirable would it be for you to reach the age you want to if you were confronted with a health problem resulting in frailty or need for care?	(1) Desired years: *M* = 85, *SD* = 10; 17% desired to live beyond 90 (2) Not desirable: 75%
Cicirelli (2011) *N* = 109, *M* = 77 years (60–99 years), 64% female	If you could choose and you knew you could maintain good health, how many more years would you like to live?	Wished for 16 more years (*SD* = 8.9)
Karppinen, Laaokkonen, Strandberg, Tilvis, and Pitkälä (2012) *N* = 283, *M* = 79 years (75–90 years), 62% female	How many more years would you still wish to live?	Wished for 8 additional years on average: <5: 26%, 5–10: 56%, >10: 18%
Donner and colleagues (2016) *N* = 1,000, 20–70 years,[b] 67% female	(1) How long would you like to live? (2) If you could be physically and mentally the same as in your 20s, how long would you like to live?	(1) 65% → desire 85 years (2) 80% → 120 or more years (unlimited: 53%)
Karppinen, Laakkonen, Strandberg, Huohvanainen, and Pitkala (2016) *N* = 1,405, = 83 years (75–96 years), 69% female	(1) Do you want to live to be 100? (2) Why? (3) Why not?	(1) 33% want to live to be 100 (2) for purpose in life: 57% (3) expecting disability: 48%; negative view of late life: 77%
Ekerdt and colleagues (2017) *N* = 90, 65–85 years,[b] 54% female	(1) Would you like to have more time? (2) If someone would offer you extra years, how many would you like to get? What for?	No wish for more time: 37%; conditional on health: 48%; unconditional wish for more years: 15%
Bowen and Skirbeck (2017)[a] *N* = 1,631, *M* = 42 years (18–64 years), 50% female	If you had your choice, how long would you like to live? That is, until what age?	Desired lifetime: 90 years (median); 17% prefer less than 80 years
Ambrosi-Randic, Nekić, and Tucak Junaković (2018) *N* = 423, *M* = 69 years (60–95 years), 57% female	What age would you like to reach? How long do you expect to live?	Desired average lifetime: 88 years (*SD* = 9), 4 years longer than expected

[a]Responses more than 120 years were recoded as 120 in this study.
[b]Mean age not reported.

study based on a representative sample, Donner and colleagues (2016) assessed responses to two items: "How long do you wish to live?" and "If you could be physically and mentally the same as in your 20s, how long would like to live?" In response to the first item two-thirds (65%) preferred to live until 85 years, while under the condition of being healthy about 80% expressed a wish to live to at least 120 years (53% desired an unlimited lifetime).

Taken together, the available studies so far suggest that four general patterns of responses to questions on longevity desires can typically be observed, that is, (a) a conditional wish for longer life as long as one feels healthy (majority), (b) a wish to continue one's life "as long as it goes" or for a few years (often accompanied by a reluctance to think about desired longevity), (c) unrealistic wishes for a very long or unlimited life (more often in samples of younger adults), and (d) no wish to live any longer than expected (more often observed in samples of very old adults). Next to such single item-based approaches of assessing preferred life duration (e.g., Lang et al., 2007), there are also other related research approaches that are based on different methods to assess motivation for prolonged and continuated life. A prominent example is the will-to-live construct used in the work of Carmel (Carmel, 2011; Carmel, Baron-Epel, & Shemy, 2007). The will-to-live scale is suitable for individuals who are currently facing situations in which they consciously question their will to live (e.g., old age, aversive life conditions). Research shows that expressions of will to live among very old individuals are—among others—associated with subjective aging indicators (Shrira, Carmel, Tovel, & Raveis, 2018) and longer survival (Carmel et al., 2007; Karppinen et al., 2012).

Attitudes on the Extension of Longevity: Motivational Mindsets

The available theoretical considerations and empirical findings on desired longevity point to a considerable

heterogeneity and breadth of diverse research venues that are not yet well connected with each other. For example, research on the value of health or attitudes to dying and death often involve issues related to the valuation of life and longevity preferences (Cicirelli, 2011; Ditto, Druley, Moore, Danks, & Smucker, 1996; Karppinen et al., 2012; Lockhart et al., 2001). In an attempt to integrate some of the different lines of reasoning and research findings, we submit that there exist three widespread classes of attitudes, expectations, and preferences with regard to a possible extension of human lifetime in modern societies that may reflect different schools of thought, such as essentialism, medicalism, and stoicism. Table 2 summarizes the different primary motives that are associated with the three perspectives on longevity and life-time extension, that is, *infinite life*, *healthy life*, and *dignified life*. We submit that these three primary motives can be used to characterize different scientific approaches on longevity, as well as individual attitudes and preferences toward longevity in everyday thinking. We refer to such perspectives as mindsets that involve sets of representations, attitudes, and ways of thinking about the meaning and value of a prolonged live.

An *essentialist mindset* views aging as a degenerative process that is inevitably associated with physical loss. It reflects the idea that aging is a determined and undesirable process, and that the human mind is held captive in a deficient biological organism. Accordingly, pathological aging cannot be differentiated from normal or healthy aging. One implication is that aging per se is viewed as pathogenetic and ought to be pushed back, for example, with antiaging medicine (De Grey, 2003). Consequently, radical extensions of the life span are expected when antiaging research is successful. A focus in research, but also in personal lifestyles, is on turning off degenerative processes in the cell, skin, organism, or mind. We refer to this as *essentialism* because it reflects a belief that aging is essentially defined by biology (Weiss, 2018). Such perspectives also become evident in attempts of bio-technical approaches that aim at surmounting limitations of the human existence. Examples of an *essentialist* motivation for longevity are also reflected in transhumanist attitudes (More & Vita-More, 2013), and become evident in the work of organizations such as the Life Extension Foundation or the Calorie Restriction Society (McGlothin & Averill, 2008). Consequently, such mindsets may also be associated with a wish to live an extremely and to date unrealistically long life while disregarding implications or consequences on social, behavioral, cognitive, and motivational aging. Recent studies of Cicirelli (2011) and Ballinger, Tisdale, Sellen, and Martin (2017) suggest that the prevalence of *essentialist* mindsets can be estimated in the range of 3–10% of respondents who wish to live forever or wish to "overcome" the natural aging process.

A *medicalist mindset* involves that human aging is viewed as burdened only when pathology occurs, and that pathological aging is different from normal aging. In this perspective, aging is associated with age-related health risks, and defined as a medical challenge. One implication is that successful aging may be defined as an absence of disease and disability (Rowe & Kahn, 1997). There is a long and wide tradition regarding such mindsets on longevity that has generated a myriad of insights and improved understanding of the potentials for extending the healthy and active life expectancy (Hay et al., 2017). Medical and clinical research has identified some of the somatic, cellular, molecular, and genetic limitations of the human life span (Kirkwood, 2005). On an individual level, medicalism is reflected in an appreciation for an extended lifetime if health functioning can be maintained, and degenerative diseases such as dementia can be avoided. Another implication might be that when endorsing a medicalist mindset, individuals may prefer to avoid the vulnerability of old age and wish to die rather than to become chronically ill or demented. Such tendencies have been investigated in studies on health values and time trade-offs. Therein individuals are asked to equate a number of years living in imperfect health (e.g., severe pain, unconsciousness, or just the current health state) with the same or a smaller number of years living in perfect health (Ayalon & King-Kallimanis, 2010; Tsevat et al., 1998) or they are asked how long they would like to live under certain medical conditions (Ditto et al., 1996; Lawton et al., 1999). Related research investigated the wish for life-sustaining treatments under different illness scenarios (e.g., Carmel & Mutran, 1997). Results indicate that most individuals express a preference to not continue life in a severely restricted health condition, while a few others want to continue living even under such adverse circumstances. Thus, a majority seems to express health-conditional longevity desires that involve continuity of one's personal capacities and resilience. In this vein,

Table 2. Mindsets of Longevity Motivation

Mindset	Motive	Guiding principle	Research focus (sample)
Essentialist	Infinite life	Motivation for extended life span involves striving to overcome biological degeneration and health declines	Antiaging medicine, rejuvenation
Medicalist	Healthy life	Motivation for extension of lifetime is conditional on physical and mental health	Curative medicine, therapeutic intervention
Stoicist	Dignified life	Motivation for a long life reflects a wish for dignity and meaning even when there is loss and vulnerability	Palliative medicine, geriatric rehabilitation

Rietjens and colleagues (2005) classified 35% of their representative life-span sample (N = 1,777 aged 20–93 years) to value quality over length of life, which reflects a medicalist perspective. Another 30% of respondents valued length over quality, and 35% were indecisive.

The *stoicist mindset for living long* reflects the idea that withstanding the challenges and risks of a long or prolonged life is part of the *conditio humana* (Cole & Sierpina, 2007), which involves striving for meaning in life, and for acceptance of one's actual life condition (Butler, 1975; Erikson, 1959). We refer to this as *stoicism* which was an ancient hellenistic school founded by Zeno of Citium (332–262 BC) suggesting that the virtues of the human mind (e.g., wisdom, courage) prevail over all external hardships or constraints in life such as physical loss (cf. P. B. Baltes & Baltes, 1990). The challenges, needs, risks, or tasks within the aging process may thus appear manageable or at least bearable as long as there is meaning in life and a sense of grace (Carmel, 2011; Lawton et al., 1999). For example, palliative and hospice care is aiming to enhance well-being and to preserve a sense of dignity, when curative therapies become ineffective. Palliative care may thus foster meaning in life even in its final stages, and in severe chronical health conditions (Steinhauser et al., 2000). Preserving dignity and meaning in a prolonged life is pivotal to a *stoicist* mindset. Thus, having a worthy and dignified life may be emphasized over the absence of chronical diseases in late life. Regarding the desired extension of lifetime, we submit that holding a stoicist mindset may involve that individuals express a valuation of life per se and "*as it comes*." This may also involve a discomfort or unwillingness to reflect about lifetime extension rather than about dignity and meaning in life. The *stoicist* motivation on longevity relies on an optimality principle of aging (P. B. Baltes & Baltes, 1990; Lang, Rohr, & Williger, 2011) that refers to a best possible life rather than to absolute standards of a good life.

Note that our description of these mindsets as *essentialist*, *medicalist*, or *stoicist*, is not intended as a typology. Rather we contend that the different patterns of longevity-related thinking may be present at the same time but with varying intensity or strength. For example, an individual may express a *stoicist* mindsets with regard to withstanding physical challenges, and at the same time follow a *medicalist* mindset that life is undesirable when suffering from Alzheimer's disease. A distinctive characteristic of the three mindsets, however, pertains to which of the salient motives of infinite, healthy, and dignified life is actually prioritized. Any pairwise comparison of two (out of the three) motives reveals overlap but also distinctive features: For example, a motive to reach an infinite life may imply striving for a healthy life. The essentialist emphasis, however, lies on the idea of overcoming degeneration as a cause of age-related decline or death (De Grey, 2003; McGlothin & Averill, 2008; More & Vita-More, 2013). One may argue that an *essentialist* mindset is taking the *medicalist* mindset to the extremes.

The medicalist motive for a healthy life implies that life should also be meaningful. However, the scope of *medicalist* views primarily lies on maintaining health and functioning. In this perspective, it is conceded that "normal" aging may also entail gains (Ayalon & King-Kallimanis, 2010; P. B. Baltes & Smith, 2003; Butler, 1975; Piersol & Bortz, 1939; Tesch-Römer & Wahl, 2017). Finally, when prioritizing a motive of dignified life this does not preclude a wish to have a healthy life. Rather, a *stoicist* mindset implies a wish for prolonged lives to reflect meaning and grace irrespective of whether this involves chronical and severe health conditions (Butler, 1975; Carmel, 2011; Kruse, 2017). In sum, differentiating the three motivational mindsets contributes to improved understanding of longevity preferences and attitudes toward longer lives.

A Heuristic Model of Motivation for Longevity

In 2007, Lang, Baltes, and Wagner proposed a preliminary information-theoretical model for the investigation of longevity motivation across adulthood. The model was built on the premise that individuals—in principle—do not know their personal future, and thus can only speculate about their preferences regarding very old age and late life. In this situation, individuals may rely on two broad sources of information about longevity, that is, (a) the cultural and societal contexts that organize the life span such as education, social structure, norms, and values, and (b) the experiential level of one's personal biography, cognition, attitudes, and expectations. Lang and colleagues (2007) observed that the experiential-level sources of information better predicted personal desires of longevity than societal-level sources of information. Advancing and extending this model, we suggest that the different mindsets of longevity motivation depend on contextual influences (e.g., culture, age, gender, personal experiences), on health functioning as well as on personal beliefs (e.g., attitudes toward aging, religiosity, future perspectives, death acceptance). Figure 1 illustrates a heuristic model of determinants and consequences of the mindsets of longevity motivation. According to this model, mindsets of longevity motivation are depending on contextual influences, mental and physical health as well as on personal beliefs. For example, better access to social security and Medicare in one's culture may be related to a stronger endorsement of *stoicist* mindsets. Personal belief systems may also differentiate between the three mindsets of longevity motivation: For example, a *stoicist* mindset may be associated with greater spirituality and death acceptance, whereas *essentialist* mindsets may be related to more secular beliefs and to more negative attitudes toward old age. *Medicalist* mindsets, in contrast may be associated with deficit-oriented views of aging, and with a stronger emphasis of personal health values. Moreover, personal

belief systems may differ depending on mental and physical health functioning, as well as on the respective societal and cultural context.

While there is some research on age and gender differences in longevity motivation (e.g., Carmel et al., 2007; Lang et al., 2007), not much is known about the role of other contextual variables, health, and personal belief systems in this regard. For example, religious beliefs and spirituality may play a critical role with regard to how long one desires to live. Few studies have explicitly explored such associations. Ballinger and colleagues (2017) explored the role of religiosity with respect to endorsing lifetime extension to 100 years, 150 years or indefinitely. The vignettes presented in this study, envisioned either minimized health decay in a prolonged life (*medicalist*), or an arrested aging process (*essentialist*) as a condition for lifetime extension. Stronger religiosity (e.g., beliefs in god's will) was generally associated with lower wishes for healthy prolongation of lifetime. Findings like that may however differ between religions and depending on the envisioned health condition (Carmel & Mutran, 1997).

The heuristic model also implies that the three mindsets of longevity motivation will be differentially related to consequences on the level of research strands as well as on the level of individual behavior. For example, a more *medicalist* mindset may involve a greater focus on health prevention. *Stoicist* mindsets may generate a palliative and accepting approach to longevity-related challenges. Lastly, *essentialist* mindsets may involve a greater emphasis on antiaging medicine, or on cosmetics. Consequently, we argue that each of the three mindsets may also be reflecting different agendas in scientific research, for example, with regard to focusing on antiaging experimental research in the lab, medical therapies for aging-related diseases, or intervention research that targets on resilience and maintaining a will to live.

There are very few examples for studies that seem to target all three mindsets of longevity motivation simultaneously, and thus help to bridge some of the gaps between the different perspectives. One example is an innovative and unique study that Cicirelli (2011) conducted with 109 adults aged 60–99 years. In this study participants reported if they would like to live forever (*esssentialist*), how long they would like to live if they could maintain good health (*medicalist*), and how the expected duration of one's life was associated with one's goals and meaning in life (*stoicist*). On average, study participants expressed unfavorable attitudes toward an infinite life and toward major life extension. If imagining to live forever or to live for 150 years, participants endorsed goals such as personal and societal achievement and helping others. If imagining to have 6 months left or up to 10 years, maintaining good relationships with others was considered more important. If imagining fewer than 6 months to be left in life, participants endorsed goals related to preparing for death.

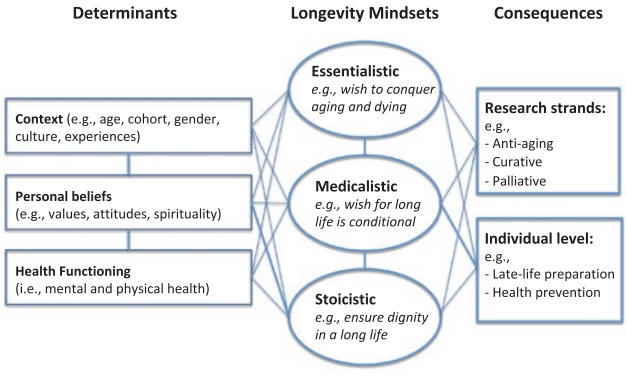

Figure 1. A heuristic model of motivational mindsets on longevity. *Note.* Lines from determinants (left column) to mindsets and to consequences are meant to indicate directed paths, whereas lines between essentialist, medicalist, and stoicist mindsets indicate the interplay among these.

A Pilot Study and Empirical Illustration

From our heuristic model (Figure 1) several implications and research questions can be derived for further research and improved understanding of the determinants and consequences of different mindsets of longevity motivation. To begin with and to give a preliminary empirical illustration of our conceptual arguments, we conducted an exploratory analysis with data from the international, interdisciplinary, and cross-cultural "Aging as Future (AaF)" Study (Rothermund, Lang, & Lessenich, 2012). Specifically, data stemmed from 1,678 participants of a cross-sectional online study conducted in 2016. Participants were initially recruited via agencies, local meeting points, and online platforms. Two hundred and twenty-eight participants were from Hong Kong, 281 from Taiwan, 175 from the United States, and 994 from Germany. Age ranged from 18 to 93 years with the average being 48.2 years (SD = 19.5). 52.6% were women, 31.5% were retired, and 71.2% lived in a relationship. Education was above average with 38.7% having a university degree. In addition, we used 4-year longitudinal data from the same study available for a subsample of 194 Germans, who participated in 2012 and 2016 (74% women; M = 53.3 years, SD = 16.3). Data were collected in an ongoing online study and participants were initially recruited via agencies, local meeting points, and online platforms.

To begin with, we focused our analysis on two single-item measures of desired longevity (i.e., "To what age would you like to live?") and expected longevity (i.e., "To what age do you expect to live?"). To be clear, we do not suggest that only two indicators will suffice to capture the breadth and depth of the three mindsets of longevity motivation. Rather, we use this approach to explore to what extent the mindsets may already become discernable in the response patterns of such succinct indicators of longevity desires. The valid responses to the question on desired longevity ranged from 25 to 500 years. For example, 106 individuals (6.4%)

wanted to live for 120 years or longer and hence, wished for a life span that clearly exceeds current demographic expectations. Such answers may reflect the wish to overcome or crucially postpone aging and dying. In contrast, 127 individuals (7.6%) wished to live for 70 years or less. One potential reason for such low longevity desires might be the wish to avoid old age as a phase of heightened vulnerability and health declines. Most participants (86.0%) however wished for a life span ranging from 71 to 119 years, with a mean desired longevity of $M = 88.9$ years ($SD = 8.3$) which is comparable to prior studies (e.g., Ambrosi-Randic et al., 2018; Lang et al., 2007). However, 14 participants gave illogical, and invalid responses (i.e., lower than current chronological age), and had to be excluded from the analysis.

In a next step, we used the responses to the question "To what age do you expect to live?" as an anchor for an individual's longevity desire. For example, one could imagine two individuals who both would like to live for 105 years. One has a family history of exceptional longevity and thus expects to become 105 years. The other one expects to live to the age of 75. Whereas the former seems to accept his or her expected longevity as desirable, the latter expresses a wish for a significantly longer life than he or she actually expects. Within our sample, 11.8% wished to die earlier than they expected, 35.6% wished to live exactly as long as they expected, 33.3% had longevity desires moderately exceeding their personal longevity expectations (by 10 years or less), and 19.3% had longevity desires strongly exceeding their personal longevity expectations (by more than 10 years). These discrepancy groups differed significantly in age, $F(3) = 64.84$, $p < .001$, and gender, $\chi^2(3) = 37.73$, $p < .001$. Specifically, the group with concordant longevity desires and expectations was the oldest, whereas the group that wished for much longer lives than expected was the youngest and predominantly male. In contrast, the group that wished for shorter lives than expected was predominantly female.

Individuals whose longevity desires and expectations are highly similar may show a greater acceptance of the expected life duration and may thus be more likely to hold stoicist attitudes. In contrast, the stronger longevity desires and longevity expectations diverge, the more likely medicalist and essentialist attitudes may become. We suggest that the interplay between desired and expected life duration contributes to improved understanding of an individual's motivation for longevity. More specific, we contend that the discrepancy between desired minus expected longevity may be used to illustrate individual differences related to contextual influences, health, and personal belief systems as suggested in the heuristic model. In the following, we present two preliminary illustrations in the scope of the proposed heuristic model. First, we explored effects of context (i.e., culture), personal belief systems (i.e., death acceptance), and health functioning (i.e., self-rated health, Figure 1) on the interplay of desired and expected longevity. Second, we used a longitudinal subsample to explore stability and change of longevity motivation across 4 years as well as potential behavioral consequences (i.e., on health behaviors). To the best of our knowledge, this is the first empirical exploration of longitudinal changes in longevity desires based on an age-heterogeneous sample of nonclinical study participants.

Determinants of Motivation for Longevity

We chose to investigate one indicator of each proposed class of determinants in relation to patterns of longevity desires and expectations. *Context* was represented here by culture differences (Germany, Hong Kong, United States, Taiwan). *Personal beliefs* were represented by death acceptance (measured with one item from Brandstädter & Wentura, 1994: "I look towards the end of life with calm"). *Health functioning* was represented by self-rated health measured with one item ranging from 1 (*very good*) to 5 (*bad*). To allow for convenient interpretation of findings, we display the results graphically in Figure 2. The graphically displayed interplays of longevity desires and longevity expectations with culture, death acceptance, and self-rated health also reached significance in a corresponding regression analysis, before and after controlling for effects of age, gender, education, and family status. Education was made comparable across cultures with ISCED categories ranging from 1 (*primary education*) to 8 (*doctoral degree*).

We tested the possible moderation effects for each of the three determinants (i.e., culture, self-rated health, death acceptance) on the association between expected longevity and the discrepancy score between desired and expected longevity. We refer to this association as it depicts the interplay between desired and expected longevity in relation to expected longevity itself. Specifically, the observed discrepancies between desired minus expected longevity were strongest when expecting one's lifetime to end before 90 years. This means, the younger one expects to die, the more likely it is to desire to live beyond one's expectations ($r = -.23$, $p < .001$). This association was however observed to be weaker in Taiwan and Hong Kong (when compared with Germany and United States, Figure 2a), weaker when death acceptance was reported to be strong (Figure 2b), and weaker when health was reported to be good (Figure 2c).

Desired and expected longevity were highly concordant within the two Eastern samples from Taiwan and Hong Kong. In contrast, individuals from the United States and Germany tended to wish for (much) longer lives, especially when they expected their own life to be rather short (the regression weights of expected longevity on the discrepancy to desired longevity were $b = -.33$, $p < .001$, for the United States, and $b = -.24$, $p < .001$, for Germany when Hong Kong served as a reference category). This result may hint to a greater likelihood of essentialist tendencies within the two Western cultures.

Among individuals, who reported strong death acceptance and good health, the discrepancies between desired and expected longevity were low when compared

with those, who felt less accepting of death (Figure 2b) and less healthy (Figure 2c). The interaction terms of death acceptance × expected longevity, $b = .93$, $p < .001$, and self-rated health × expected longevity, $b = -.85$, $p < .001$, significantly predicted the discrepancy between desired and expected longevity. This indicates that individuals who accepted their death, wished for life durations close to their personal expectations, and may thus express a more stoicist attitude toward prolonged longevity. With regard to self-rated health, associations were a bit more complex (Figure 2c). Individuals in relatively good self-rated health seemed to express longevity desires that only slightly exceeded their expectations. Individuals who felt less healthy however, showed more extreme discrepancies between longevity desires and expectations. They wished for much longer lives when they expected to die early, but for much shorter lives when they expected to live a long life. This pattern points to some of the dynamics involved in medicalist mindsets of longevity motivation.

Change and Stability of Desired Longevity and Effects on Health Behavior

To illustrate the malleability of mindsets related to longevity desires and expectations, we explored the rank-order stability and patterns of change within the 4-year longitudinal subsample. For desired longevity, the 4-year stability was $r = .57$, $p < .001$. Thereby, 33% wished for the exact same life duration at T1 and T2. Further 36% wished for a shorter life duration at T2 in comparison to T1 with a mean difference of $M = -8.5$ years ($SD = 7.5$), and 31% wished for a longer life at T2 compared with T1 ($M = +8.2$ years, $SD = 8.8$). For expected longevity, the 4-year stability was clearly higher, $r = .79$, $p < .001$. Thereby, 34% expected the exact same life duration at T1 and T2. Further 31% expected a shorter life duration at T2 compared with T1 with a mean difference of −6.44 years ($SD = 4.34$ years). Another 34% expected a longer life at T2 compared with T1 with a mean difference of +5.91 years (4.78 years). Both measures thus varied over the period of 4 years, however, the extent of variation was larger for desired longevity than for expected longevity. The discrepancy between desired and expected longevity had a 4-year stability of $r = .51$, $p < .001$. Most individuals (44%) thereby expressed a stable positive discrepancy (i.e., they wished to live longer than expected at both time points). Further 21% expressed a stable equilibrium (i.e., desired longevity was equal to expected longevity at both time points), and 4% expressed a stable negative discrepancy. Altogether 31% of response patterns involved a change of direction over time (e.g., from wishing to live shorter than expected to wishing to live longer than expected).

An explorative analysis of this longitudinal data suggested that patterns of desired and expected longevity were associated with changes in health behaviors over

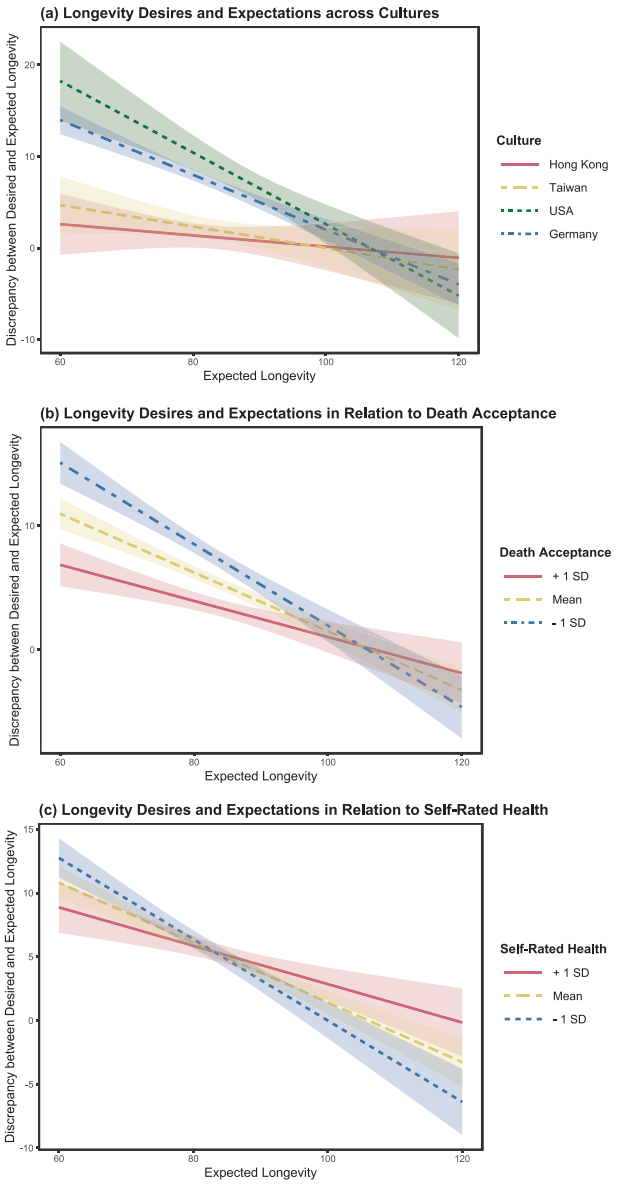

Figure 2. Longevity desires and expectations as related to (a) culture, (b) death acceptance, and (c) self-rated health. *Note.* For reasons of statistical clarity and presentation, extreme longevity desires and expectations smaller than 60 and larger than 120 were adjusted to 60 and 120 years, respectively.

4 years. After controlling for chronological age, gender, education, family status, and the T1 health behavior score, the T3 health behavior score (aggregated over self-reported frequencies of physical activity, healthy nutrition, and an active lifestyle; ranging from 0 to 21; Cronbach's $\alpha = .68$) was significantly predicted by an interaction between desired and expected longevity, $b = -.57$, $p = .005$. As illustrated in Figure 3, the interaction suggested that health behaviors were most frequent among individuals who desired shorter lives than they expected. On the other hand, when longevity expectations were rather low, a higher desired longevity seemed to motivate individuals to behave in a healthy way.

Conclusion and Future Outlook

To sum up, in accordance with our proposed heuristic model, we observed that the interplay of desired and expected longevity varied depending on culture, death acceptance, and self-rated health as prototypical indicators of determinants. Based on such preliminary findings, future research should include further indications of determinants related to *context*, *health functioning,* and *personal belief systems* to predict mindsets of longevity motivation. Moreover, items explicitly targeting on each of the three mindsets of longevity motivation should be used. In this vein, future research may benefit from including additional indicators of motivation for longevity. In a perfect scenario, items and indicators specifically addressing one of the three mindsets for longevity motivation might be applied. We submit that a more straightforward identification of the three mindsets requires more variables that capture some of the specific characteristics of each profile. Examples might be questions like "*If you could, would you want to live forever?*" (Cicirelli, 2011) for the essentialist profile, "*If you could trade one year in perfect health for ten years in decent health and dependency on the help of others, would you do so?*" (Lawton et al., 1999) for the medicalist profile, and "*Do you think you will be able to accept your own old age with all its positive and negative aspects, and challenges?*" for the stoicist profile.

Finally, across a time interval of 4 years, a substantial number of individuals seemed to change their respective motivation for longevity. According to our heuristic model, one may assume that such changes depend on changes in context, personal beliefs, and health functioning. Further research may investigate the determinants of such changes in longevity motivation in more systematic ways with longitudinal and experimental research designs.

Motivation for longevity and extension of lifetime reflect a new and emerging issue in most modern societies. Not much is known about what motivates individuals at different ages to wish to live a long life under the different circumstances that old age may entail. In an attempt to integrate existing theoretical considerations and empirical findings, we submitted a heuristic model for investigating the determinants and consequences of three mindsets of longevity motivation, that is, an *essentialist*, *medicalist*, and *stoicist* mindset. In an empirical illustration with cross-cultural data, we observed that the interplay of desired and expected longevity was related to effects of culture, self-rated health, and death acceptance. Moreover, preliminary longitudinal data suggests that longevity desires are malleable over time, and also predict changes in health behaviors. Future research may have to make use of more mixed-method designs to also address the possible differences between these mindsets in narrative portrayals, in addition to quantitative indicators. Lastly, it is suggested that the mindsets also have differential behavioral consequences with regard to how individuals invest in late-life preparation and in what ways they want to approach old age.

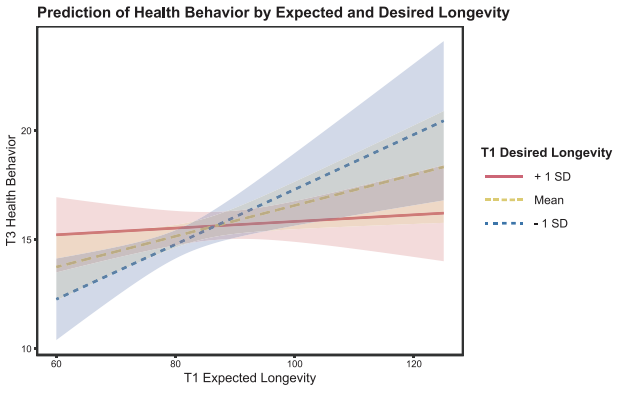

Figure 3. Prediction of T2 health behavior by T1 expected longevity and T1 desired longevity.

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Conflict of Interest

None reported.

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3

Personal Ideals of Aging and Longevity: The Role of Subjective Discordances

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Abstract

Following theoretical models on wishful thinking, we investigated (1) whether personal aging ideals discord from self-perceptions of aging, (2) how such aging discordances evolve across adulthood, (3) whether current aging discordances are related to anticipated future aging discordances, and (4) whether aging discordances are related to a lower psychological well-being. We captured subjective age discordance (SAD) as the discrepancy between current perceived age and ideal age, and subjective life expectancy discordance (SLED) as the discrepancy between perceived life expectancy and ideal life expectancy. For analyses, we used cross-sectional data from 1015 individuals (M = 40.0 years, SD = 17.9 years; 52.1% women) and two-year longitudinal data from 258 individuals (M = 55.3 years, SD = 17.3 years; 70.5% women). Both aging discordances were clearly present across the adult lifespan, that is, ideal ages were lower than perceived ages and ideal life expectancies were higher than perceived life expectancies. A stronger subjective life expectancy discordance was associated with a stronger subjective age discordance both cross-sectionally and longitudinally. Both discordances were also associated with lower psychological well-being in the cross-sectional analyses. Over time, lower life satisfaction predicted increases in subjective age discordance, and subjective life expectancy discordance predicted increases in negative affect. The results indicate that subjective age discordance and subjective life expectancy discordance are both highly prevalent and potentially functional as they seem related to psychological well-being. The discussion focuses on SAD and SLED as constructs for future research, their antecedents, and potential consequences.

Keywords: subjective aging, subjective life expectancy, motivation for longevity, aging ideals, psychological well-being

Personal Ideals of Aging and Longevity: The Role of Subjective Discordances

At all ages, individuals hold ideals that reflect a contrast to their perceived or anticipated state (Cantor, Norem, Niedenthal, Langston, & Brower, 1987; Ryff, 1991; Kotter-Grühn, Wiest, Zurek, & Scheibe, 2009). Such wishful thinking—whether it is reasonable, improbable, or utopian—shapes the lives of individuals and is closely tied to aspects of the self and well-being (Higgins, 1987). In the literature on aging psychology, there are some general ideal-like conceptualizations such as *optimal aging* (Aldwin, Spiro, & Park, 2006) or *successful aging* (Rowe & Kahn, 1997). However, there has been little research on what individuals wish for and consider ideal when it comes to their own aging, for example with respect to how old they would ideally like to be, or how long they would ideally like to live.

Taking motivational and developmental perspectives into account, it should be of particular interest, whether individuals perceive these ideals as close or distant, that is, whether they perceive concordance or discordance with their personal aging ideals. In this vein, we focus our research on introducing and investigating two types of aging discordance: *Subjective age discordance* (SAD) is defined as the discrepancy between the age an individual feels like and the age an individual would ideally like to be. *Subjective life expectancy discordance* (SLED) is defined as the discrepancy between the life expectancy an individual anticipates for him- or herself and the life expectancy an individual would ideally like to have. Researching these aging discordances may enrich the literature on motivation for longevity (e.g., Ekerdt, Koss, Li, Münch, Lessenich, & Fung, 2017; Lang & Rupprecht, 2019) and subjective aging (e.g., Diehl et al., 2014; Kotter-Grühn, Kornadt, & Stephan, 2016). It may furthermore give us a better understanding about potential internal aging conflicts, how they unfold across the lifespan, and how they relate with psychological well-being.

Theoretical Perspectives on Wishful Thinking and Subjective Discordances

There are a number of psychological theories that address wishful thinking, the resulting subjective discordances, and how they relate to psychological well-being. The *self-discrepancy theory* by Higgins (1987) for example states that individuals experience discrepancies between contents of their self-concept (i.e., self-perceptions) and their ideal self-states. These discrepancies are not just experienced and dissolved spontaneously, but can become of chronic nature. Depending on their magnitude and accessibility, they are

expected to relate with feelings of dejection, such as disappointment, dissatisfaction, and sadness. In the context of our work, discordances between ideals and perceptions of one's personal age and one's personal life expectancy may similarly persist over time and relate negatively to psychological well-being.

Self-discrepancy theory defines ideal self-states as hopes, wishes, and aspirations (Higgins, 1987), such as wishing for a somewhat longer life expectancy than one anticipates. However, aging ideals may also lie outside the scope of attainable aspirations, for example when wishing to live unrealistically long or to be much younger again. In this vein, *life longings* (Scheibe, Freund, and Baltes, 2007) were defined as utopian and unattainable ideals, which carry symbolic meaning, are the result of evaluating and reflecting on one's current developmental state, and extend beyond the present for example by idealizing a past or future state. Whereas the longings themselves describe positive states, they are also associated with feelings of incompleteness and dissatisfaction with the current life situation and self, and thus, a lower psychological well-being (Scheibe et al., 2007). The wish to be much younger again may for example reflect a longing for youth, be the result of reflecting on one's current and past developmental state, and may ultimately be associated with feelings of dissatisfaction and incompleteness.

Building on such theoretical considerations, we submit that psychological well-being is associated with the presence and stability of subjective age discordance and subjective life expectancy discordance. In the following, we introduce and discuss the two discordances in detail, and review their possible associations with each other and with psychological well-being.

Subjective Age Discordance

Asking how old an individual feels is one of the more widespread assessments of subjective aging (Kotter-Grühn et al., 2016). There is much evidence suggesting that middle-aged and older adults typically feel younger than their calendar age (Kaufman & Elder, 2002; Rubin & Berntsen, 2006), and that how old one feels is related to variables reflective of the individual aging process, such as health and mastery (e.g., Infurna, Gerstorf, Robertson, Berg, & Zarit, 2010; Schafer & Shippee, 2010). In the following, we use the term "*perceived age*" (cf. Uotinen, Rantanen, & Suutama, 2005) to describe the construct that is also labeled as felt age, subjective age, or age identity in the literature. By

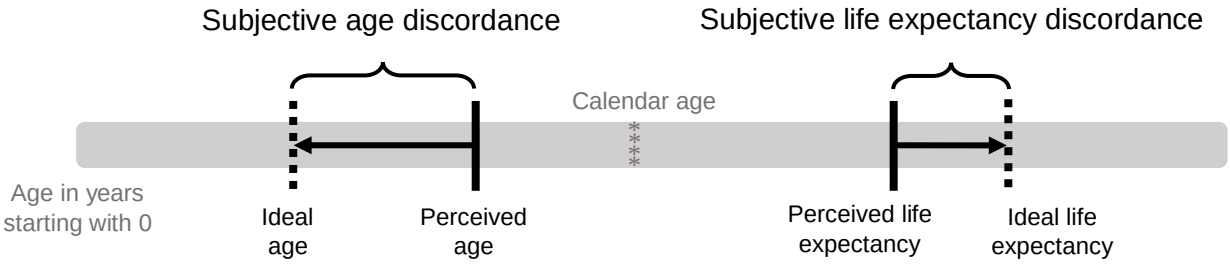
doing so, we highlight the parallel between *perceived age* and *perceived life expectancy* as both are self-perceptions of the aging process. We compare *perceived ages* to *ideal ages*, rather than objective calendar ages. Comparing perceived age to ideal age should reveal purely subjective cognitions and motivations taking place within the self (cf. Higgins, 1987). That is, how satisfied one is with one's currently perceived aging, and how attainable one's ideal age appears. For example, a young ideal age may still be perceived as concordant if the perception of one's self and one's aging entails feeling young, irrespective of calendar age.

Whereas perceived age can be seen as a self-perception of the current aging process (Kotter-Grühn et al., 2016; Barrett & Montepare, 2015), ideal age reflects a wish or desire for a possibly counterfactual, remembered or imagined age status. When investigated conjointly, individuals consistently present younger ideal ages than perceived ages (Barnes-Farrell, Rumery, & Swody, 2002; Kaufman & Elder, 2002; Uotinen, Rantanen, Suutama, & Ruoppila, 2006). This phenomenon reflects the presence of subjective age discordance (SAD), as illustrated in Figure 3.1. Prior research also indicates that perceived age and ideal age relate differently to constructs such as health and psychological well-being (Demakakos, Gjonca, & Nazroo, 2007; Hubley & Russell, 2009; Ward, 2010). Specifically, an older perceived age but a younger ideal age were associated with lower psychological well-being (Keyes & Westerhof, 2012; Ward, 2010; Uotinen, Suutama, & Ruoppila, 2003), underlining our hypothesis for a relation between subjective age discordance and lower psychological well-being. A concordance of ideal and perceived age—presumably rarer than a discordance—may either indicate acceptance of one's current aging situation by feeling and wishing to be one's calendar age, or a successful dissociation from one's calendar age by feeling and wishing to be the same younger age (Weiss & Lang, 2012), and may thus be related with a higher psychological well-being.

From the perspective of longings, ideal age may reflect more than just the desire to be at a certain age, but may have symbolic meaning. It may reflect the desire for characteristics, capabilities, and opportunities one associates with that age (e.g., light-heartedness, independence, economic success, health, or a certain appearance; Barker & Galambos, 2005; Yu, Kozar, & Damhorst, 2013). In this vein, the discrepancy between one's ideal age and one's perceived age could also reflect a discrepancy between desired and currently experienced characteristics, capabilities, and opportunities of the self.

Figure 3.1

Illustration of subjective age discordance and subjective life expectancy discordance



Subjective Life Expectancy Discordance

Whereas subjective age discordance captures current aging perceptions, subjective life expectancy discordance (SLED) refers to an anticipated aging process in the distant personal future, that is, the end of one's life. When individuals are asked for the life expectancy they anticipate for themselves (i.e., perceived life expectancy) they usually give reasonable estimates and tend to rely on objectively important factors such as their family history of longevity, personal health behaviors, and social support (Smith, Taylor, & Sloan, 2001; Griffin, Loh, & Hesketh, 2013). Ideal life expectancy has mainly been studied as an outcome variable indicating attitudes towards aging, longevity, and end-of-life (Cicirelli, 2011; Ekerdt et al., 2016). A higher ideal life expectancy has however also been linked to better self-rated health and higher life satisfaction (Bowen & Skirbekk, 2017; Lang, Baltes, & Wagner 2007).

Ideal life expectancies often seem to extend beyond perceived life expectancies (Ambrosi-Randić, Nekić, & Junaković, 2018; Lang et al., 2007). Such subjective life expectancy discordances (as depicted in Figure 3.1) may indicate that an individual considers his or her perceived life expectancy as insufficient and has a wish for an extended lifetime, and additional years in life. Similar to ideal age, ideal life expectancy may also have symbolic meaning. The wish to live longer than one anticipates may for example reflect the desire for a 'late freedom' (Bowen & Skirbekk, 2017) or for a less burdened, decelerated, or even halted future aging process (cf. Lang & Rupprecht, 2019).

The Two Aging Discordances across Adulthood

Subjective age discordance and subjective life expectancy discordance may both reflect a dissatisfaction with the perceived aging process, the passing of time, and the unidirectional motion towards end of life (see Figure 3.1 for illustration). In terms of socioemotional selectivity theory (e.g., Carstensen, Isaacowitz, & Charles, 1997), a strong subjective life expectancy discordance may be reflective of experiencing one's lifetime as (too) limited and restrained. One response to perceiving one's lifetime as limited is to symbolically extend it, for example by investing in emotionally meaningful goals, and pursuing generative efforts (Lang & Carstensen, 2002; Lang & Rupprecht, 2019b). Similarly, individuals experiencing a strong SLED may symbolically extend their lives by longing for younger ages. We would thus assume a relation between SAD and SLED: Individuals who wish to live longer than they anticipate, would also wish to be younger than they feel.

The two discordances may also operate and impact individuals differently across adulthood (cf. Barrett & Montepare, 2015). While getting older, ideal age should become more distant, increasingly out of reach, and thus, unattainable (Chopik, Bremner, Johnson, & Giasson, 2018; Ward, 2013). SLED on the other side should become closer and therefore more pressing and concerning. Associations between SAD, SLED, and psychological well-being may thus become stronger as individuals move away from their ideal age and towards their perceived and ideal life expectancies.

Based on the literature on age trajectories in ideal age and perceived age, we also expect SAD to particularly increase during older age, when perceived age rises with calendar age while ideal age remains low (Chopik et al., 2018; Rubin & Berntsen, 2006; Ward, 2013), as well as during early adulthood, when individuals switch from feeling and wishing to be older than their calendar age to feeling and wishing to be younger (Chopik et al., 2018; Galambos, Turner, & Tilton-Weaver, 2005; Rubin & Berntsen, 2006). The scarce research on age trajectories in perceived and ideal life expectancy does not suggest clear hypotheses for age trajectories in SLED (Ambrosi-Randić et al., 2018; Chopik et al., 2018). In summary, we were thus interested in age trajectories of SAD and SLED as well as their interactions with linear and quadratic age in their relations to each other and to psychological well-being.

Aging Discordances and Psychological Well-Being

Self-discrepancy theory suggests that discrepancies between self-perceptions and ideal self-states—and thus, SAD and SLED—lead to a lower affective well-being (Higgins, 1987). The *life longings* approach deals with psychological well-being in a broader way, by including affective as well as cognitive aspects of well-being and assuming a potentially reciprocal relationship between well-being and *life longings* (Scheibe et al., 2007): Unrealizable *life longings* may lead to dissatisfaction and feelings of incompleteness. Dissatisfaction and feelings of incompleteness may however also result in the formation of new ideals and *life longings*. Recent research additionally underlines the role of cognitive well-being in forming ideals. Namely, lower life satisfaction may provoke a greater desire for change and a weaker desire for stability (Luhmann & Hennecke, 2017) and may thus lead to a stronger discordance between aging self-perceptions and newly formed aging ideals over time. We thus investigated positive affect, negative affect, and life satisfaction (cf. Diener, 1984) as antecedents, correlates, and outcomes of SAD and SLED.

The Present Research

The present research focuses on introducing and investigating two types of aging discordance, that is, subjective age discordance (SAD), and subjective life expectancy discordance (SLED). For introducing SAD and SLED, we focused on their prevalence, their age trajectories, and their expected incremental validity over and above the underlying constructs (ideal age, perceived age, ideal life expectancy, and perceived life expectancy) in regard to psychological well-being, self-rated health, and social satisfaction as a measure of social embeddedness. For investigating the functionality of SAD and SLED, we examined the interrelation of the two discordances and their reciprocal relations to a lower psychological well-being, that is, lower life satisfaction, lower positive affect, and higher negative affect. Lastly, we explored whether the associations between SAD, SLED, and psychological well-being changed across the lifespan.

Method

Procedure

Data were collected as part of the "Aging as Future" project (Rothermund, Lang, & Lessenich, 2012) during online studies in 2014 and 2016 taking place in Germany. The participants were either part of an ongoing longitudinal study of our project or were newly recruited via local institutions or announcements in suitable online platforms (e.g., "Feierabend.de", an online platform for German senior citizens). Participants gave informed consent at the beginning of each online questionnaire and received a reimbursement of 20€ after completion. Next to the topics addressed in this publication, participants answered to a range of questions on old-age preparation and future outlook. The study received approval of compliance with ethical rules and data security law by a governmental authority of the State of Bavaria (Germany).

Samples

Cross-Sectional Sample. In 2016, 1015 individuals participated in the online study. Participants' age ranged from 18 to 93 years, with an average of 40.0 years (*SD* = 17.9 years). 52.1% of the sample were women, 18.4% were retired, 27.0% were married, 44.1% held a university degree, and the median household net income lied between 2000 and 3000€. Cross-sectional analyses were based on the data from up to 976 participants (96.2% of the overall sample) who provided answers to the central study variables (ideal age, perceived age, ideal life expectancy, perceived life expectancy).

Longitudinal Sample. Out of the 1015 individuals taking part in the 2016 online study (T2), 258 had already participated in the 2014 online study (T1). The follow-up rate over the two years (*M* = 2.06 years, *SD* = 0.20 years) was 52.9%. Individuals who participated in both time points were slightly older than individuals who participated only in T1, $t(486) = 3.41$, $p < .001$, $d = 0.31$, but did not differ in any other variable used in the analyses. The age of the 258 longitudinal participants ranged from 19 to 85 years at T1, with an average of 53.3 years (*SD* = 17.33 years). 70.5% were women, 40.0% were retired, 41.5% were married, 58.9% held a university degree and the median household net income lied between 2000 and 3000€. Longitudinal analyses were based on the data of up to 248 participants (96.1% of the overall sample) who provided answers to the central study variables.

Measures

Perceived age and ideal age. Perceived age was assessed with the item: "Expressed in number of years, how old are you feeling at this point in your life?". Ideal age was assessed with the item: "And if you were able to choose your age, how old would you like to be now?". Following recommendations by Kotter-Grühn et al. (2016) as well as Rubin and Berntsen (2006) for samples with wide age ranges, we used proportional discrepancy scores of perceived and ideal age. We calculated those by subtracting calendar age from perceived age or ideal age, and dividing the respective raw discrepancy by calendar age. Proportional discrepancies lower than -0.75 and higher than +0.75 were adapted to -0.75 and +0.75 (N = 5 or 0.5% for T2 perceived age; N = 9 or 0.9% for T2 ideal age) only after calculating the subjective age discordance.

Subjective age discordance. Comparably, we also calculated Subjective Age Discordance (SAD) as a proportional discrepancy score, namely by subtracting ideal age from perceived age and dividing this raw discrepancy by calendar age. Raw scores and raw discrepancies may namely have a different meaning in different age groups (Kotter-Grühn et al., 2016; Rubin & Berntsen, 2006). For example, a raw SAD of +10 years (i.e., perceived age is 10 years older than ideal age) should reflect a strong SAD for a 25-year-old, but a comparably weaker SAD for a 75-year-old. The proportional SAD scores would however be +0.4 and +0.13 and should thus take into account the different perspectives of aging individuals. Indeed, the moderate age correlation of the *raw* SAD score, r = .30, p < .001, suggested that the scopes of ideal age and perceived age increased with calendar age. The small age correlation of the *proportional* SAD score, r = .11, p < .001, indicated a greater independence from calendar age in our age diverse sample. Despite this difference, the *raw* SAD score and the *proportional* SAD score were highly related, r = .90, p < .001, and yielded strongly comparable results in the regression analyses.

In order to allow for statistical analyses not too heavily influenced by extreme values, we adapted discrepancies lower than -0.75 and higher than +0.75 to -0.75 and +0.75, respectively (N = 25 or 2.6% in the cross-sectional sample; N = 7 or 2.8% in the longitudinal sample). By doing so, we retained the general direction of the discordance without giving too much weight to its extreme magnitude.

Perceived and ideal life expectancy. Perceived life expectancy was assessed with the item: "To what age do you expect to live?". Ideal life expectancy was assessed with the item: "To what age would you like to live?". Nine individuals (0.9% in the cross-sectional data) provided inconsistent answers to these questions by giving ages below their own calendar age. Those values were excluded from analyses. Life expectancies greater than 125 years were adapted to a currently imaginable lifespan of 125 years (N = 5 or 0.5% for T2 perceived life expectancy; N = 44 or 4.5% for T2 ideal life expectancy) only after calculating the subjective life expectancy discordance.

Subjective life expectancy discordance. Subjective Life Expectancy Discordance (SLED) was calculated as a raw discrepancy score by subtracting ideal life expectancy from perceived life expectancy. We did not adapt the SLED discrepancy score for calendar age as perceived life expectancy and ideal life expectancy refer to the same life phase, that is, end of life, across all age groups. Thus, they should be more comparable across the lifespan than ideal and perceived ages that mostly refer to a more youthful past whose extension varies greatly across the lifespan. Indeed, the age correlation of SLED was only small, r = .14, p < .001. Note that *positive* SAD scores, but *negative* SLED scores reflect the type of discordances we expected (i.e., ideal age < perceived age and ideal life expectancy > perceived life expectancy). Thus, an association between a stronger SAD and a stronger SLED would be reflected by a negative correlation between the two measures.

In order to allow for statistical analyses not too heavily influenced by extreme values, we adapted SLED values lower than -50 and higher than 50 to -50 and 50, respectively (N = 34 or 3.5% in the cross-sectional sample; N = 3 or 1.2% in the longitudinal sample). Thereby, the direction of the discordance was preserved, while its magnitude was adapted so that single cases would not disproportionally affect the statistical analyses.

Psychological well-being. Life satisfaction was assessed with the question "How satisfied are you with your life, all things considered?". Participants answered on a scale ranging from 0 (*completely dissatsified*) to 10 (*completely satisfied*). The single item measures cognitive-evaluative aspects of psychological well-being and is well established in psychological aging research (Gerstorf et al., 2010; Lucas, Clark, Georgellis, & Diener, 2003). To assess positive affect, participants were asked whether they felt active, alert, and excited during the past four weeks on a scale ranging from 1 (*not at all*) to 5

(*extremely*) (cf., PANAS scale; Watson, Clark, & Tellegen, 1998). Cronbach's alpha for the three items was .74 at T2 and .69 at T1. To assess negative affect, participants were asked whether they felt afraid, upset, and nervous during the past four weeks on a scale ranging from 1 (*not at all*) to 5 (*extremely*) (cf., PANAS scale; Watson et al., 1998). Cronbach's alpha for the three items was .73 at T2 and .78 at T1.

Calendar age. Calendar age was calculated as years since birth and centered before age^2 and age^3 were calculated. Linear age, quadratic age (age^2), and cubic age (age^3) were then used for exploring non-linear age trajectories in SAD and SLED. Linear age and quadratic age were furthermore used for testing age interactions.

Covariates. In prior research, self-rated health and measures of social embeddedness were related to perceived and ideal age (Schafer & Shippee, 2010; Hubley & Russell, 2009), to perceived and ideal life expectancy (Griffin et al., 2013; Lang et al., 2007), as well as to psychological well-being (e.g., Bruine de Bruin, Parker, & Strough, 2019; Diener, 1984). We thus added self-rated health and social satisfaction to the correlational and regression analyses in order to validate the newly introduced discordances, but also to make sure that the relations among the main study variables persisted after accounting for these covariates. Self-rated health was measured with the question "How would you describe your current health?" on a scale ranging from 1 (*bad*) to 5 (*very good*). Social satisfaction was calculated as the mean of the two items "How satisfied are you with your relationships to your family members?" and "How satisfied are you with your network of friends", which were both answered on a scale ranging from 1 (*not at all satisfied*) to 7 (*very satisfied*). The correlation of the two items was $r = .50$, $p < .001$, at both time points.

Furthermore, we added sex and income as covariates. Sex was coded as 0 for men and 1 for women and was chosen as a covariate because of its relation to life expectancy (WHO, 2019) and subjective aging variables (e.g., Kaufman & Elder, 2002; Ward, 2013). Household income was chosen as a socioeconomic resource that may contribute to longer actual, perceived, and ideal life expectancies (Ambrosi-Randić et al., 2018; WHO, 2019). It was assessed as net income in categories ranging from 1 (*less than 1000€*) to 7 (*more than 6000€*). Missing values in household income ($N = 62$ or 4.9% at T2; $N = 16$ or 6.2% at T1) were estimated based on variables such as saving behavior and the possession of real estate.

Data Analyses

In a first step, we modeled ideal age, perceived age, ideal life expectancy, perceived life expectancy, SAD, and SLED as functions of linear, quadratic, and cubic calendar age. By doing so, we were able to explore linear and non-linear age trajectories.

In a second step, we estimated correlations among the main study variables. We then compared the magnitude of the discordances' correlations with the magnitude of the underlying constructs' correlations (i.e., ideal age, perceived age, ideal life expectancy, and perceived life expectancy). Using a method suggested by Zou (2007) we estimated 95% confidence intervals for the difference between two overlapping correlations (e.g., $|r|_{SAD,\ Life\ Satisfaction} - |r|_{Perceived\ Age,\ Life\ Satisfaction}$). If the resulting confidence interval included 0, the two correlations were comparable in magnitude. If not, there were significant differences in the magnitude of the correlations (e.g., $|r|_{SAD,\ Life\ Satisfaction} > |r|_{Perceived\ Age,\ Life\ Satisfaction}$).

For testing the cross-sectional and longitudinal interrelations between the two discordances and the psychological well-being variables, we computed stepwise regression analyses. We first entered the two discordances, followed by the four covariates as well as the three age trends. In a third step, the interactions between linear and quadratic age and the (centered) discordances were added. For reasons of parsimony and interpretability of the main effects, we report only those age interaction effects in the final model that reached significance. For the longitudinal regression analyses, the same order was chosen. However, the baseline score of the respective outcome variable was added before any other predictor variables. Psychological well-being variables were entered to the model in a last step. In the tables, only the standardized regression coefficients of the final models are depicted. However, ΔR^2 and *F*-tests indicate how the model fit changed between the three to five steps of adding variables and interactions.

Results

Table 3.1 shows the descriptives and stabilities of the main study variables. In the broader cross-sectional sample, the mean SAD was 0.11 (SD = 0.23) and significantly different from 0, which would indicate a concordance between perceived and ideal age, $t(975) = 14.93$, $p < .001$, $d = 0.97$. On average, the participants thus reported an older perceived age than ideal age, and the size of that discordance was around 11.1% of an individual's calendar age. Subjective age discordance (i.e., ideal age < perceived age) was

thereby experienced by 60.1% of the participants. Further 21.5% of the participants reported equal ideal and perceived ages and 18.3% of the participants reported ideal ages exceeding their respective perceived ages. The longitudinal data of SAD indicated a two-year stability of r = .57, which was comparable to the two-year stabilities of perceived age, r = .56, and ideal age, r = .61.

The mean SLED was -7.81 (SD = 13.09) and was also significantly different from 0, $t(966)$ = -18.55, p < .001, d = 1.19. The participants' perceived life expectancies were thus around 8 years lower than their ideal life expectancies. Subjective life expectancy discordance (i.e., ideal life expectancy > perceived life expectancy) was thereby experienced by 63.4% of the participants. Further 25.4% of the participants reported equal ideal and perceived life expectancies and 11.2% of the participants reported ideal life expectancies lower than their perceived life expectancies. In the longitudinal data, the two-year stability of SLED was r = .65, and thus somewhat higher than the stability of SAD, but lower than the two-year stabilities of perceived life expectancy, r = .81, and ideal life expectancy, r = .77.

Table 3.1

Descriptives and Stability Coefficients of the Main Study Variables at T1 and T2

	T1 (N = 248)		T2 (N = 976)		
Variable	*M*	*SD*	*M*	*SD*	$r_{T1,\ T2}$
Perceived age	-0.07	0.16	-0.06	0.17	.56
Ideal age	-0.17	0.19	-0.17	0.23	.61
SAD	0.10	0.21	0.11	0.23	.57
Perceived life expectancy	84.21	9.19	82.90	10.68	.81
Ideal life expectancy	90.02	10.90	90.30	13.45	.77
SLED	-5.76	10.14	-7.81	13.09	.65
Life satisfaction	7.26	2.09	6.91	2.01	.61
Positive affect	3.54	0.69	3.41	0.85	.62
Negative affect	1.90	0.87	2.14	0.87	.64
Self-rated health	3.62	0.96	3.82	0.95	.68
Social satisfaction	5.21	1.35	5.16	1.28	.75

Notes. SAD = subjective age discordance; SLED = subjective life expectancy discordance. All stability coefficients were highly significant, p < .001.

Aging Discordances across Adulthood

To better understand linear and non-linear age trends in SAD and SLED, we modeled them and their underlying constructs (perceived age, ideal age, perceived life expectancy, ideal life expectancy) as functions of linear, quadratic, and cubic age (see Figure 3.2).

Proportional perceived age decreased during young adulthood and was stable throughout midlife and old age (linear: b = -.003, p < .001; quadratic: b = .0002, p < .001; cubic: b = -.000002, p < .018). Proportional ideal age decreased during young adulthood and old age, was also relatively stable during midlife, and overall substantially lower than perceived age (linear: b = -.004, p < .001; quadratic: b = .0004, p < .001; cubic: b = -.000006, p < .001). The participants thus experienced subjective age discordance (ideal age < perceived age) throughout adulthood. Only the very youngest participants presented comparable perceived and ideal ages. SAD increased throughout early adulthood, was rather stable until late midlife, before it significantly increased again during old age (linear: n. s.; quadratic: b = -.0002, p < .001; cubic: b = .000005, p < .001).

Perceived life expectancy was lowest in midlife and increased during old age (linear: n. s.; quadratic: b = .005, p < .001; cubic: n. s.). Ideal life expectancy was stable throughout most of adulthood and marginally increased in old age (linear: b = -.07, p = .087; quadratic: n. s.; cubic: b = .00008, p = .095). SLED thus became slightly and continuously weaker across adulthood (linear: b = .11, p < .001; quadratic: n.s.; cubic: n.s.), but was still present (< 0) among the oldest old. Across the whole age range of our sample, the participants thus seemed to experience both kinds of aging discordances, as they wished to be younger than they felt and wished to live longer than they anticipated on average. The magnitude of the two discordances however seemed to vary with age.

Correlates of the Aging Discordances

Cross-sectionally, a stronger subjective age discordance was correlated to lower life satisfaction, lower positive affect, higher negative affect, worse self-rated health, and lower social satisfaction (see Table 3.2). SAD was correlated significantly stronger to all five of these constructs than both ideal age (95% CIs [.06, .15], [.05, .14], [.06, .15], [.08, .16], [.04, .12]) and perceived age (95% CIs [.04, .18], [.02, .16], [.02, .16], [.08, .22], [.005, .14]) alone. Longitudinally, a stronger SAD was reciprocally correlated with lower life

Figure 3.2

Linear, quadratic, and cubic age trends of the two aging discordances and their underlying constructs (N = 967 to 976)

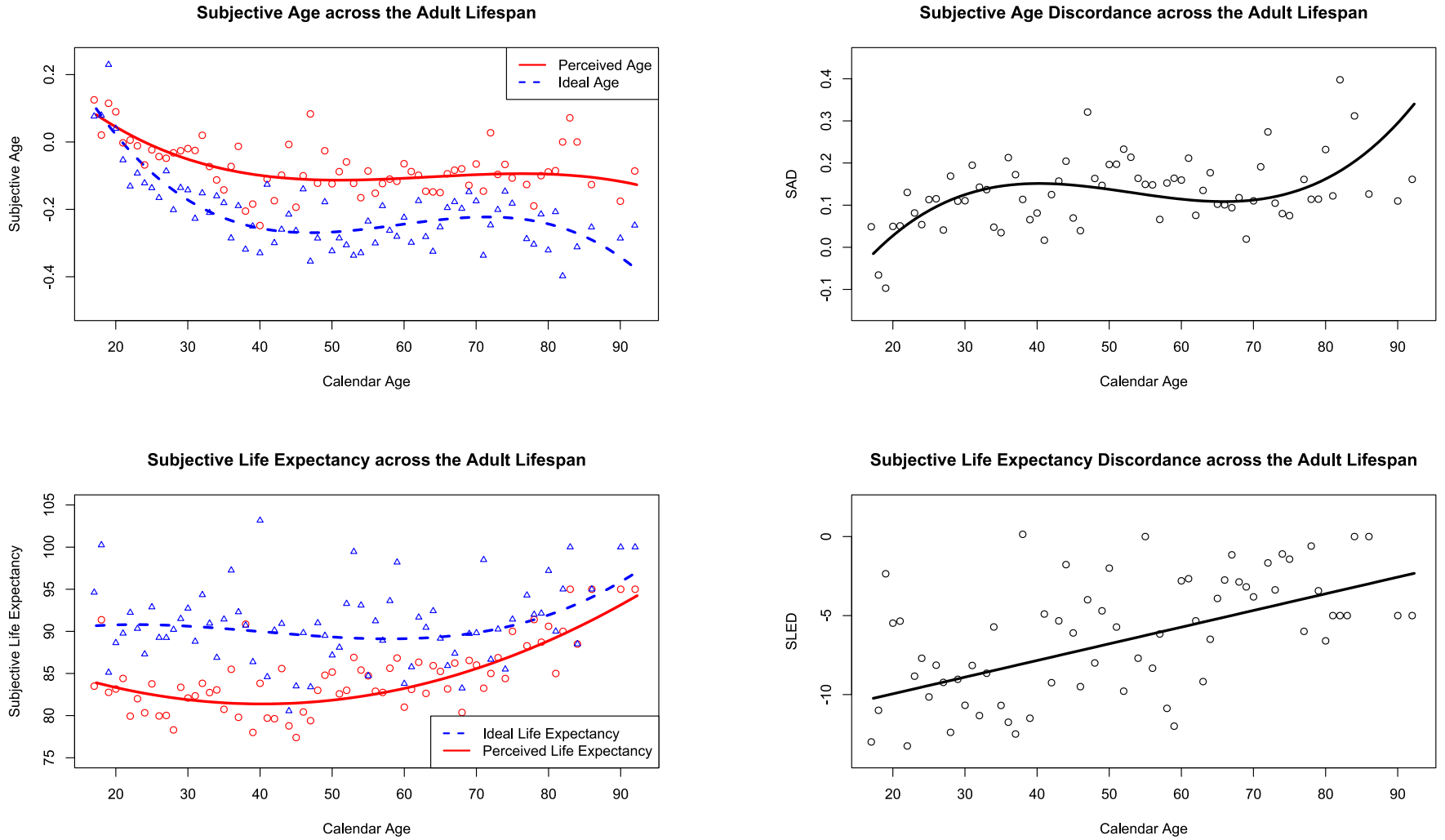


Table 3.2

Cross-Sectional Bivariate Correlations of the Variables (N = 976)

Measure	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Perceived age	.31**	.38**	-.25**	-.14**	-.01	-.17**	-.15**	.15**	-.19**	-.12**	-.23**	-.02	-.09*
2. Ideal age	–	-.75**	.02	-.15**	.19**	.17**	.14**	-.13**	.21**	.11**	-.28**	.05	-.03
3. SAD		–	-.19**	.04	-.18**	-.28**	-.24**	.24**	-.34**	-.19**	.11**	-.06	-.03
4. Perceived life expectancy			–	.51**	.22**	.21**	.19**	-.17**	.26**	.15**	.14**	.06	.05
5. Ideal life expectancy				–	-.70**	.03	.06	.06	.10*	.04	-.02	-.13**	-.04
6. SLED					–	.14**	.08*	-.20**	.10*	.09*	.14**	.19**	.10*
7. Life satisfaction						–	.56**	-.48**	.45**	.44**	.17**	.02	.18**
8. Positive affect							–	-.37**	.39**	.31**	.12**	.03	.09*
9. Negative affect								–	-.26**	-.29**	-.27**	-.02	-.10*
10. Self-rated health									–	.26**	-.21**	-.06	.06
11. Social satisfaction										–	.03	.02	.08*
12. Calendar age											–	.15**	.17**
13. Sex												–	-.09*
14. Income													–

Notes. SAD = subjective age discordance; SLED = subjective life expectancy discordance. *$p < .05$. **$p < .001$.

satisfaction, lower positive affect, worse self-rated health, and lower social satisfaction (see Supplementary Table S1). It did not predict negative affect, but was predicted by it. SAD's longitudinal correlations were either significantly stronger (8 out of 20 correlations) or comparable to the ones of perceived age and ideal age, respectively. This picture of SAD being a stronger or comparable correlate, predictor, and outcome than either perceived age or ideal age alone carried over to the regression analyses.

A stronger subjective life expectancy discordance was also significantly correlated to lower life satisfaction, lower positive affect, higher negative affect, worse self-rated health, and lower social satisfaction cross-sectionally (see Table 3.2). SLED's cross-sectional correlations were significantly weaker or comparable to the ones of perceived life expectancy (95% CIs [-.15, .01], [-.19, -.03], [-.05, .10], [-.24, -.08], [-.13, .03]), and significantly stronger or comparable to the ones of ideal life expectancy (95% CIs [.06, .16], [-.03, .07], [.09, .19], [-.05, .05], [.01, .11]). Longitudinally, a stronger SLED was reciprocally related to lower life satisfaction and higher negative affect. SLED was furthermore predicted by lower positive affect and lower social satisfaction (see Supplementary Table S1). SLED's longitudinal correlations were either significantly weaker (5 out of 10 correlations) or comparable to the ones of perceived age, as well as mostly comparable to the ones of ideal age (only 1 out of 10 was significantly stronger for SAD). After accounting for the covariates in the regression analyses, SLED appeared to have effects comparable to perceived life expectancy and ideal life expectancy alone.

Interrelation between Subjective Age Discordance and Subjective Life Expectancy Discordance

In the cross-sectional sample, a stronger subjective age discordance was related to a stronger subjective life expectancy discordance, β = -.15, p < .001, ΔR^2 = 3.9% (see Table 3.3). This negative interrelation means that participants who wished to be younger than they felt, were also more likely to wish to live longer than they anticipated (cf. Figure 3.1).

In the longitudinal analyses (Table 3.4), SLED and SAD were also related with each other. Namely, a stronger SLED at T1 predicted increases in SAD over time, β = -.14, p = .008, ΔR^2 = 2.9%. A stronger life expectancy discordance (i.e., wishing to live longer than one anticipates) may hence contribute to a stronger subjective age discordance (i.e., wishing to be younger than one feels). Increases in SAD were also predicted by a worse

Table 3.3

Cross-Sectional Regression Analyses with Subjective Age Discordance and Psychological Well-Being as Outcome Variables (N = 914)

	Subjective Age Discordance		Life Satisfaction		Positive Affect		Negative Affect	
Variables	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
SAD	–		-0.12***		-0.14***		0.29***	
SLED	-0.15***		0.14**		-0.03		-0.09**	
		3.9%***		8.3%***		6.2%***		8.0%***
Age	0.08		0.21***		0.28***		-0.44***	
Age^2	-0.31***		-0.08		-0.20**		0.01	
Age^3	0.26**		0.11		0.06		0.16	
Sex	-0.06		0.01		0.01		0.04	
Income	-0.05		0.07**		-0.00		0.01	
Self-rated health	-0.28***		0.37***		0.33***		-0.21***	
Social satisfaction	-0.10**		0.31***		0.20***		-0.19***	
		13.5%***		31.0%***		19.6%***		17.3%***
SAD*age	–		–		–		0.12***	
SAD*age^2	–		–		–		-0.16***	
SLED*age	–		0.09**		–		–	
SLED*age^2	–		-0.15***		–		–	
		–		1.1%***		–		1.3%***

Notes. Stepwise longitudinal regression analyses with ΔR^2 and related F-tests, as well as standardized regression coefficients (β) of the final models are depicted. Only significant age interactions are part of these final models. SAD = subjective age discordance; SLED = subjective life expectancy discordance. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3.4

Longitudinal Regression Analyses with the Two Discordances and Psychological Well-Being as Outcome Variables (N = 240-245)

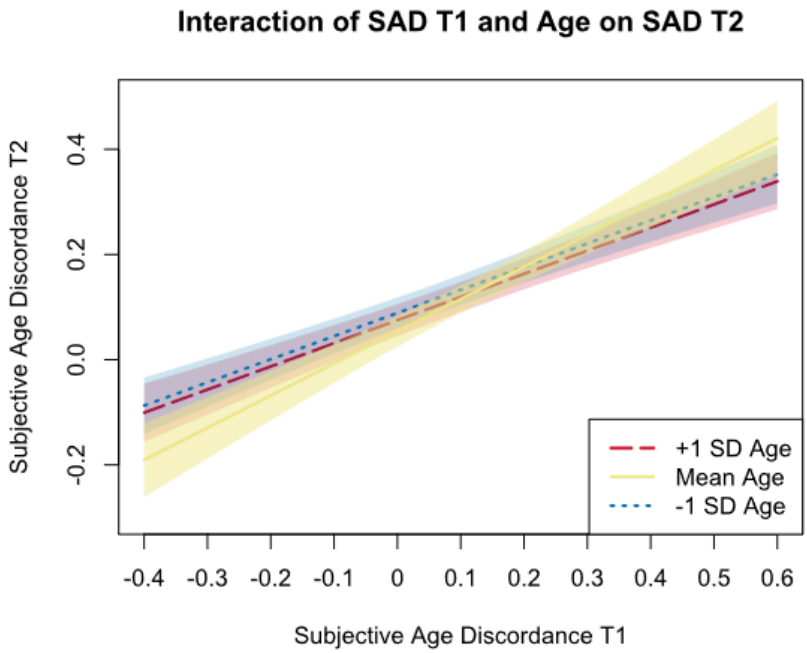
	T2 Subjective Age Discordance		T2 Subjective Life Expectancy Discordance		T2 Life Satisfaction		T2 Positive Affect		T2 Negative Affect	
T1 Variables	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2
T1 Variable	0.68***		0.61***		0.43***		0.47***		0.47***	
		32.0%***		42.3%***		36.7%***		38.4%***		41.0%***
SAD	–		0.02		0.00		0.06		-0.07	
SLED	-0.14**		–		0.01		-0.06		-0.10*	
		2.9%**		0.0%		0.1%		0.1%		1.8%*
Age	-0.18		0.10		-0.01		-0.04		-0.43***	
Age^2	0.09		0.02		0.06		-0.07		0.05	
Age^3	0.17		-0.08		0.08		0.03		0.33*	
Sex	-0.01		0.09°		-0.01		0.07		0.03	
Income	-0.02		0.04		0.10°		0.03		-0.01	
Self-rated health	-0.09		-0.04		0.09		0.12*		-0.10°	
Social satisfaction	-0.00		-0.00		0.09		0.05		-0.08	
		6.5%***		1.9%		4.1%*		3.8%*		5.1%**
SAD*age	–		–		–		–		–	
SAD*age^2	-0.32***		–		–		–		–	
SAD*age^3	–		–		–		–		–	
SLED*age	–		–		–		–		–	
SLED*age^2	–		–		–		–		–	
SLED*age^3	–		–		–		–		–	
		4.7%***		–		–		–		–
Life satisfaction	-0.16*		-0.02		–		0.22**		-0.08	
Positive affect	-0.11°		-0.08		0.16*		–		-0.00	
Negative affect	-0.05		-0.12°		-0.01		0.06		–	
		2.4%*		1.6%		1.6%*		2.4%**		0.3%

Notes. Stepwise longitudinal regression analyses with ΔR^2 and related F-tests, as well as standardized regression coefficients (β) of the final models are depicted. Only significant age interactions are part of these final models. In the first step the respective T1 variable was entered (e.g., T1 SAD when T2 SAD was the outcome variable). SAD = subjective age discordance; SLED = subjective life expectancy discordance. °$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

self-rated health, although this association vanished as soon as life satisfaction was entered as a predictor (final model: self-rated health: β = -.09, p = .108, life satisfaction: β = -.16, p = .023). Additionally, there was a significant quadratic age interaction with SAD T1 in predicting SAD T2, β = -.32, p < .001, ΔR^2 = 4.7%. Figure 3.3 shows that the association between SAD T1 and SAD T2 was strongest among middle-aged participants, and thus, SAD was most stable in midlife. This longitudinal result was in accordance with the cross-sectional age trends of SAD (see Figure 3.2), which indicated little differences in SAD during midlife.

Figure 3.3

Age-dependent time trends in subjective age discordance



Notes. Original non-centered scales are used. SAD = subjective age discordance

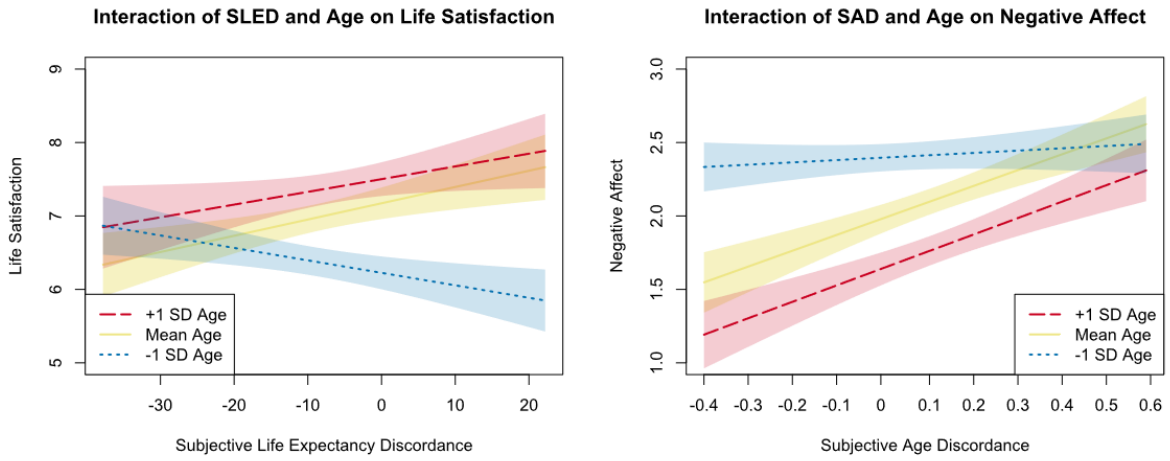
SLED T2 was not predicted by SAD T1 and only marginally predicted by sex (men experienced a slightly more pronounced increase in SLED) and negative affect over time. Taken together, SAD and SLED exhibited small, but significant and presumably age-invariant relations as none of the related age interactions reached significance. Over the scope of two years, SLED predicted SAD, but not the other way around.

Associations between the Two Aging Discordances and Psychological Well-Being

Cross-sectionally, a stronger subjective age discordance and a stronger subjective life expectancy discordance were both associated with weaker life satisfaction, β = -.12, p < .001, and β = .14, p = .001, ΔR^2 = 8.3% (see Table 3). Whereas the relation between SAD and life satisfaction appeared to be age-invariant, SLED interacted with both linear and quadratic age in its relation to life satisfaction, β = -.09, p = .002, and β = -.15, p < .001, ΔR^2 = 1.1%. As depicted in Figure 3.4, the hypothesized cross-sectional association between a stronger SLED and lower life satisfaction was evident among middle-aged and older adults. Among younger adults, the trend was however reversed, as a strong SLED was associated with a higher life satisfaction.

Figure 3.4

Cross-sectional interactions between the two aging discordances and calendar age in predicting psychological well-being



Notes. Original non-centered scales are used. SLED = subjective life expectancy discordance. SAD = subjective age discordance

Positive affect was cross-sectionally associated with a lower SAD, β = -.14, p < .001, ΔR^2 = 6.2%, but unrelated to SLED. Negative affect was cross-sectionally associated with both a stronger SAD, and a stronger SLED, β = .29, p < .001, and β = -.09, p = .003, ΔR^2 = 6.2%. Whereas the relation between SLED and negative affect appeared age-invariant, SAD interacted with both linear and quadratic age in its relation to negative affect, β = .12, p < .001, and β = -.16, p < .001, ΔR^2 = 1.3%. As depicted in Figure 3.3, the hypothesized cross-sectional association between a stronger SAD and a stronger negative affect was

only evident among middle-aged and older participants; there was no relation between SAD and negative affect among the younger participants.

In the longitudinal analyses (Table 3.4), a stronger SAD was significantly predicted by weaker life satisfaction, β = -.16, p = .023, as well as marginally predicted by lower positive affect, β = -.11, p = .081, ΔR^2 = 1.3%. SAD did not predict psychological well-being over time. In contrast, SLED and negative affect exhibited a small reciprocal relationship, with a stronger SLED being marginally predicted by negative affect, β = -.12, p = .059, ΔR^2 = 1.6%, and significantly predicting negative affect over time, β = -.10, p = .046, ΔR^2 = 1.8%.

Taken together, SAD (i.e., wishing to be younger than one feels) was cross-sectionally related with and longitudinally predicted by life satisfaction and positive affect. SLED (i.e., wishing to live longer than one anticipates) was consistently and reciprocally related to negative affect. Interaction effects (SAD*age and SAD*age^2 on negative affect; SLED*age and SLED*age^2 on life satisfaction) were rather modest, but hinted to stronger relations between the two discordances and psychological well-being in midlife and old age.

Discussion

Across the whole age range of our sample, most participants held aging ideals that were in discordance with their perceived current or anticipated future aging situation. On average, they wished to be younger than they felt to be (subjective age discordance) and wished to live longer than they anticipated to live (subjective life expectancy discordance). SAD and SLED were weakly related with each other with a stronger SLED predicting increases in SAD over two years. As expected, SAD and SLED were both negatively associated with psychological well-being. SAD was related and predicted by life satisfaction and positive affect, whereas SLED exhibited a potentially reciprocal relation with negative affect. In the following, we discuss the findings and potential future research questions on SAD and SLED, as well as aging discordances in general.

The Concept of Subjective Age Discordance

Ideal age and even more perceived age are well-established and often used indicators of subjective aging (Kotter-Grühn et al., 2016). Whereas prior research has predominantly focused on the respective discrepancies between calendar age and these

two subjective aging constructs (e.g., Keyes & Westerhof, 2012), we directly investigated the discrepancy between ideal age and perceived age. By doing so, we aimed to fully focus on the subjective side of the aging process and to account for the very different aging experiences individuals of the same calendar age may encounter (e.g., MacDonald, DeCarlo, & Dixon, 2011). Thereby, we complement prior research on the differential effects of perceived age and ideal age (Keyes & Westerhof, 2012; Ward, 2010; Uotinen et al., 2003) as well as early analyses on the discrepancy between these constructs itself (Barak & Gould, 1985; Uotinen et al., 2006). Cross-sectional analyses in our sample indicated that subjective age discordance exhibited significantly stronger correlations to self-rated health, social satisfaction, positive affect, negative affect, and life satisfaction than perceived age and ideal age alone. SAD might hence allow for an improved understanding of discordances between aging self-perceptions and aging ideals, as well as the interplay between perceived age, ideal age, and calendar age.

The significant covariances between SAD, SLED, self-rated health, social satisfaction, and all three aspects of psychological well-being persisted over the scope of two years. Increases in SAD over the two years were however only predicted by a stronger SLED, lower life satisfaction, and marginally by lower positive affect. SAD thus appeared to be the outcome of an unsatisfying life and aging process. Dissatisfaction could lead to perceiving one's aging more negatively and feeling older (cf. Westerhof & Barrett, 2005), to the formation of new aging ideals (Luhmann & Hennecke et al., 2017; Scheibe et al., 2007), and to perceiving aging ideals as increasingly out of reach. Thereby, SAD seems to manifest very early in adulthood, particularly due to increasingly lower proportional ideal ages during this period of life. As expected, SAD exhibited most stability during midlife (see Figures 3.2 and 3.3) and increased again in old age.

Future research on SAD as an outcome variable might investigate how specific aging-related experiences (e.g., physical symptoms, memory difficulties, interactions with grandchildren) relate to SAD within broader time frames, but also on a situational and everyday basis (as it has already been done with ideal age and perceived age separately; Bellingtier, Neupert, & Kotter-Grühn, 2017). Despite lack of support for our hypothesis that SAD influences psychological well-being over time, future research may still consider SAD as a predictor. In order to resolve or process the discordance, individuals may namely set related goals and change their behavior (e.g., Higgins, 1987; Brandtstädter & Renner, 1990). When coping with SAD, individuals may for example dress more youthfully, go on

a diet, or apply anti-aging products (cf., Öberg & Tornstam, 2001; Yu et al., 2013). They may accordingly strive for health, economic success, or other characteristics they associate with their ideal age. In general, it might thus be worth to gain a deeper functional understanding of SAD, its antecedents, its consequences, and what it represents for different individuals and at different ages (e.g., a longing for youth, for health, for autonomy, etc.).

The Concept of Subjective Life Expectancy Discordance

Although research on perceived life expectancy and ideal life expectancy has expanded in recent years, the discordance between these two has only rarely been investigated (Lang & Rupprecht, 2019). In our sample, the bivariate correlations of subjective life expectancy discordance to psychological well-being, self-rated health, and social satisfaction were only small and seemed comparable to the ones of perceived and ideal life expectancy. Future research may need to further explore whether SLED possesses incremental validity over perceived life expectancy and ideal life expectancy alone.

Compatible to self-discrepancy theory (Higgins, 1987), subjective life expectancy discordance was related to a stronger negative affect both cross-sectionally and in the longitudinal change analyses. Wishing to live longer than one anticipates may thus elicit or reinforce feelings of anxiety, anger, and sadness about the own aging process, the anticipated health situation, and the passing of time. Additionally, SLED predicted increases in SAD. Wishing to be younger again may thus be a response to perceiving one's lifetime as insufficient and one's distant aging process as unfavorable. It may also be a way to symbolically extend one's lifetime (see Figure 3.1).

SLED itself was rather stable across the two years and slightly stronger among younger participants compared to older ones. Out of the variables we were investigating, stronger negative affect and male sex were the only ones marginally predicting increases in SLED. Future research may thus concentrate on other antecedents of subjective life expectancy discordance such as context (e.g., culture, cohort, experiences with longevity), personal beliefs (e.g., spirituality, values), and health functioning (Lang & Rupprecht, 2019). Whereas our work focused on negative consequences of SLED, future research may also explore potential positive consequences. Namely, many participants' ideal life

expectancies seemed to be in reach as they were only some years higher than the respective perceived life expectancies. Such potentially dissolvable discordances may depict a specific motivation for longevity and provoke goals and behaviors towards the ideal life expectancy, such as living a healthy lifestyle (Lang & Rupprecht, 2019).

Aging Discordances

Our results indicate that subjective aging discordances and unfulfilled aging ideals are highly prevalent, and negatively related to psychological well-being—just as theoretical models on wishful thinking would predict (Higgins, 1987; Scheibe et al., 2007). The extent of the two discordances seemed to vary between individuals and age groups, as well as over time. Additionally, in some of our analyses, the relations between aging discordances and psychological well-being were stronger among middle-aged and older as compared to younger adults. These findings highlight that subjective aging discordances as well as their meaning and impact might change across adulthood. They also imply the existence of age-specific antecedents and outcomes as well as a certain malleability and intervenability. Future research and potential interventions targeting aging discordances could thereby concentrate on the interplay of perceptions and ideals. Over time or following interventions, individuals might for example become more accepting of their perceptions, perceive themselves closer to their ideals, or set more realistic ideals in general. The symbolic meaning behind the ideals (e.g., health, autonomy) may hereby be of greater importance than the mere number of years individuals state as ideal.

Future research should also further explore the positive and negative consequences of subjective aging discordances. Whereas concordances might come with the highest psychological well-being, small and reconcilable discordances may come with a certain amount of tension and dissatisfaction, but may also function as motivators, translate into goals and behavior changes, and thus shape the development of an individual positively (Cantor et al., 1987; Brandtstädter & Renner, 1990). Only if personal ideals are unattainable and crucially different from self-perceptions, interventions may indeed be appropriate. Aspects of age-specificity, intervenability, and ambivalence of subjective aging discordances may thus be of interest for future research.

In our work, we chose to operationalize subjective aging discordances in very parsimonious ways using single item indicators that have been part of many panel studies and research projects. The items needed for SAD and SLED might therefore be easily available for future research. However, aging discordances might also be investigated with newly developed scales that could capture aging ideals as well as disappointed and exceeded expectations towards the aging process more explicitly and specifically for certain domains.

Limitations

One limitation is that our longitudinal results should be interpreted with caution as they stem from a selective sample of relatively well-educated, and predominantly female participants. Also, the follow-up rate of 53% might be less than ideal (although there were no clear dropout effects) and the time span of two years might be too short to depict major changes and interrelations among the variables. Consequently, the association between negative affect and SAD and the association between life satisfaction and SLED only appeared in the cross-sectional regression analyses, but not in the longitudinal ones. The other multivariate and bivariate associations (particularly those between SAD and SLED, SAD and life satisfaction, and SLED and negative affect) however occurred in the longitudinal sample as well as the more heterogeneous cross-sectional sample, which speaks in favor of their validity.

Another limitation might be the only small to moderate effect sizes in our analyses. One reason for this might be the use of single item measures and the computation of manifest discrepancy scores, which may come with a lack of reliability. Another reason might be potential non-linear effects. Specifically, there was a small group of individuals that experienced discordances in the opposite directions (i.e., 18% wished to be older than they felt and 11% wished to live shorter than they anticipated). In our analyses, we treated such discordances in the opposite directions as if they were an increased form of concordance (i.e., as if ideals were similar to perceptions). Although we did not expect these discordances in the opposite directions as readily, they may also reflect self-discrepancies within the aging process and may come with similar consequences as the aging discordances in the more prominent direction. Future research may need to validate and explore this opposite form of discordance more thoroughly.

Conclusion

Across the adult lifespan, individuals seem to experience discordances in their aging process. On average, they wish to be younger than they feel to be and wish to live longer than they anticipate. In a broader cross-sectional and a smaller longitudinal sample, the two discordances were related to each other, and were both negatively related to psychological well-being. Whereas subjective age discordance appeared to be an outcome of dissatisfaction, subjective life expectancy discordance predicted increases in negative affect over time. With our results highlighting the prevalence and potential functionality of subjective age discordance and subjective life expectancy discordance, we hope to open up research on these two specific concepts, but also quite generally on aging discordances as discrepancies between aging ideals and self-perceptions of aging.

4

COVID-19 and Perceiving Finitude: Associations with Future Time Perspective, Death Anxiety, and Ideal Life Expectancy

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Abstract

The coronavirus pandemic threatens the health, future, and life of individuals and might hence accentuate perceptions of the fragility and finitude of life. We investigated how different perceptions of the pandemic (regarding the virus as a health threat and perceiving social and financial restrictions due to the pandemic) relate to different perceptions of life's finitude (i.e., future time perspective, death anxiety, and ideal life expectancy). Using longitudinal data from 1042 adults (68% women; aged 18 to 95 years) gathered within the first and within the second peak of the pandemic in Germany, we expected decreases in future time perspective and ideal life expectancy, as well as increases in death anxiety in response to threatening perceptions of the pandemic. The results indicated decreasing future time perspectives, an accentuation of death anxiety right at the beginning of the pandemic, as well as stable ideal life expectancies. There was a tendency for more pronounced change among older adults. Initial levels and changes in the perceptions of finitude could partly be explained by initial and changing perceptions of the pandemic. Next to perceptions targeting the threat of the virus itself, perceptions of strong social and financial restrictions during the pandemic contributed to an altered stance towards the finitude of life. Concluding, we discuss stability and variation in perceptions of the finitude of life during a time of major societal change and a potentially life-threatening pandemic.

Keywords: Finitude of Life, Future Time Perspective, Ideal Life Expectancy, Death Anxiety, Coronavirus Pandemic

COVID-19 and Perceiving Finitude: Associations with Future Time Perspective, Death Anxiety, and Ideal Life Expectancy

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been continuously spreading for the past year and has heavily affected lives across the globe. Due to the severe health consequences of the virus (Zhou et al., 2020), far-reaching measures such as stay-at-home orders have been taken to control the spread of the virus. Since its beginning, the pandemic has been accentuating the unpredictability and fragility of life, for example by posing a significant threat to the health and life of individuals and by resulting in extensive social and economic consequences (Lenzen et al., 2020). Early research has already indicated increased anxiety, depression, stress, and future insecurities as psychological consequences of the pandemic (Elmer et al., 2020; Mahmud et al., 2020; Wilson et al., 2020; Xiong et al., 2020). The present research investigates whether and how the pandemic affects perceptions of the finitude of life. We start with introducing different burdensome perceptions of the pandemic that may generally affect how finite and fragile individuals perceive their own future and life. Thereafter, we introduce the psychological constructs of finitude we chose to investigate and relate them specifically to perceptions of the pandemic.

Perceptions of the Pandemic and the Finitude of Life

The most natural association between the coronavirus pandemic and the finitude of life is the virus's obvious threat to the health of individuals. The subjective threat of the virus and the individual experience of vulnerability should stem from perceptions of both susceptibility to and severity of a potential infection with SARS-CoV-2. That is, how likely individuals deem they will become infected with the virus and how severe they would expect the coronavirus disease to be in their personal case (cf. Bruine de Bruin, 2020). Individuals perceiving a high risk of infection or a severe pathology may hence feel particularly threatened by the virus. We expect them to perceive their lives as more fragile and to feel directly confronted with a potentially lethal health threat and the finitude of life. In contrast, when an infection with the virus is perceived as unlikely or harmless, it should pose little to no threat to one's health and life.

Apart from the threat that is directly elicited by the virus itself, the measures taken by the national governments in order to contain the spread of the virus may albeit not threaten the life, but the future of individuals. Those official measures have resulted in

significant social and financial consequences for individuals (Elmer et al., 2020; Prochazka et al., 2020) and should thus dampen future opportunities and give rise to future insecurities. Social restrictions such as stay-at-home orders threaten new and existing social relationships and potentially elicit or reinforce worries regarding one's future social embeddedness (Elmer et al., 2020). Financial restrictions resulting from job loss, shortened working hours, and economic crisis, similarly influence the opportunities individuals (perceive to) have in the future and should give rise to an array of future insecurities (Wilson et al., 2020). We thus expect that individuals who experience major social and financial restrictions during the pandemic also perceive their future and life as more fragile, constrained, and finite.

Different theoretical models like terror management theory (Solomon et al., 1991) and socioemotional selectivity theory (Carstensen et al., 1999) highlight the far-reaching consequences of perceiving one's future as threatened and constrained. For example, terror management theory argues that being aware of death and life's finitude results in feelings of terror which are encountered by validating one's cultural worldview and enhancing one's self-esteem. Socioemotional selectivity theory argues that perceiving one's future as limited and constrained is associated with a prioritization of emotionally meaningful goals. In contrast, an extended future time perspective would be related to the prioritization of instrumental and knowledge-related goals (Lang & Carstensen, 2002). Both theories hence assume that perceiving a finite future leads to shifting priorities and goals, and has the potential to change an individual's course of action and life (Fung et al., 2020). It is thus crucial to understand whether perceptions of the finitude of life are affected by the pandemic. Therefore, we investigated associations between four different perceptions of the pandemic (severity, susceptibility, social restrictions, and financial restrictions) and different perceptions of the finitude of life. In order to broadly capture the pandemic's impact on perceptions of finitude, we chose to investigate cross-sectional relations and trajectories in different psychological constructs targeting the finitude of life: Future time perspective with its three subcomponents future time opportunity, future time extension, and future time constraint, death anxiety, and ideal life expectancy. In the following, we will introduce these psychological constructs of finitude in more detail and discuss them in the scope of the recent pandemic.

Future Time Perspective

The construct of future time perspective is closely tied to socioemotional selectivity theory and describes how individuals represent their remaining future and time in life (Carstensen et al., 1999). Serious threats to health and life and rather gradual decreases in subjective health have been linked to perceptions of a more limited future time (Carstensen et al., 1999; Kooji & Van de Voorde, 2011; Korff & Biemann, 2020). Similarly, future time perspective has been successfully manipulated by encouraging individuals to imagine different health scenarios (Kellough & Knight, 2012; Strough et al., 2019). Expecting a potential coronavirus disease to be fatal should hence be directly linked to a shrinking future time perspective. Expecting a non-fatal, but serious and consequential course of disease could similarly be linked to perceiving a more finite and limited future time. In general, shrinking resources in terms of health, social relationships, as well as socioeconomic status have been associated with a more limited future time perspective (Korff & Biemann, 2020; Fieulaine & Apostolidis, 2012). Next to the threat of the coronavirus itself, social and financial restrictions during the pandemic may thus also result in perceiving a finite and constrained future with little opportunities.

Recent work on the construct of future time perspective suggests the presence of three subcomponents of future time perspective (Rohr et al., 2017). The first subcomponent is targeting perceptions of future time opportunities and possibilities, the second is targeting perceptions of future time extension and the time in life remaining, and the third is targeting perceptions of future time constraints and limitations. Perceptions of the pandemic may differentially relate to the three subcomponents: Pandemic-related threats to the health of individuals (i.e., severity and susceptibility to the virus) should particularly endanger the length of life and thus, the component of future time extension. More general pandemic-related threats regarding the present and future of individuals (i.e., social and financial restrictions) may however rather affect future time opportunity and constraint. Differentiating between the three subcomponents should thus allow for a more precise understanding in how burdensome perceptions of the pandemic may contribute to a generally shrinking future time perspective.

Death Anxiety

In contrast to the cognitive construct of future time perspective, death anxiety reflects an affective perception of the finitude of life. It can be defined as "the state in which an individual experiences apprehension, worry, or fear related to death and dying" (Carpenito-Moyet, 2008, p. 39) and is thought of as inherent to human life (Becker, 1973). According to terror management theory, death anxiety can be brought to the forefront by mortality cues such as personal illness, natural disasters, or everyday events like walking past a funeral home (e.g., Grant & Wade-Benzoni, 2009; Jonas et al., 2002). The coronavirus, especially when perceived as threatening for oneself, should clearly function as a reminder of mortality and thus, potentially reinforce death anxiety (cf. Courtney et al., 2020). Apart from this, some research points to the beneficial impact of social support and close social relationships on death anxiety (Mikulincer et al., 2002). Experiencing restrictions of one's social relationships during the pandemic might hence marginally contribute to death anxiety as well. In summary, we expect death anxiety to increase during the pandemic, particularly when the coronavirus is perceived as (life) threatening and social relationships are restrained.

Ideal Life Expectancy

The time span an individual would ideally like to live reflects both motivations (Karppinen et al., 2016; Rupprecht & Lang, 2020) and attitudes (Bowen & Skirbekk, 2017; Lang & Rupprecht, 2019) towards the finitude of life. Choosing an ideal life expectancy hereby involves projecting into a distant future—in case of the pandemic, a future filled with even more insecurities and worries than usual. Research suggests that individuals rely on the anticipated availability of resources such as health and social support when determining their ideal life expectancy (Brandão et al., 2019; Ekerdt et al., 2017). Experiencing or anticipating a loss of resources due to the pandemic (e.g., serious health consequences) could thus be associated with lowering one's ideal life expectancy. Additionally, individuals might feel humbled by the pandemic and its consequences and in response accommodate their goals and longings (cf. Rupprecht & Lang, 2020) regarding the finitude and length of their own lives. Taken together, we thus expect decreases in ideal life expectancy due to the pandemic.

Role of Chronological Age

As individuals grow older, they naturally come closer to the end of their lives and tend to adapt their perceptions of life's finitude. Particularly, older adults usually perceive a more limited future time perspective (Lang & Carstensen, 2002), and report less death anxiety (Russac et al., 2007) than younger adults. Older adults may thus more easily integrate experiences of vulnerability and confrontations with mortality into their perceptions of finitude and accommodate them in response to the pandemic. In contrast, for many younger adults in Germany, the coronavirus pandemic is among the first immediate threats to their life and future. Younger adults may thus be more tenacious and try to uphold their perceptions of an extended future. The dual-process framework (Brandtstädter & Rothermund, 2002) underlines such assimilative tendencies in younger adults' future-related goals and perceptions as well as accommodative tendencies in the future-related goals and perceptions of older adults. On a different note, older adults have also been feeling more vulnerable to the virus (Bruine de Bruin, 2020) and age has been communicated as a major risk factor for a severe to deadly pathogenesis of the coronavirus disease 2019 (COVID-19; e.g., Zhou et al., 2020). Overall, we would thus expect to see stronger changes in the finitude perceptions of older adults in response to the pandemic.

The Current Study

In the scope of this study we investigated whether perceptions of the pandemic (severity, susceptibility, social restrictions, and financial restrictions) affect how individuals perceive the finitude of their own lives. We included different psychological constructs to assess perceptions of the finitude of life (i.e., future time perspective with its subcomponents future time opportunity, future time extension, and future time constraint, death anxiety, and ideal life expectancy). For our analyses, we used longitudinal data from two main assessments, one taking place during the first peak of the pandemic in Germany (March/April 2020) and the other taking place during the second peak of the pandemic in Germany (November/December 2020). This allowed us to test relations between perceptions of the pandemic and perceptions of finitude right at the beginning of the pandemic in Germany. Additionally, we were able to investigate changes in perceptions of finitude following the lasting pandemic and the second surge of

infections. Recent research conducted in Germany indicates that the prolonged pandemic might be particularly impactful for psychological outcomes (Moradian et al., 2021).

We hypothesized future time perspective and ideal life expectancy to decrease and death anxiety to increase during the pandemic. We expected initially burdensome perceptions of the pandemic to relate to the perception of a more finite life and future both cross-sectionally and over time. Additionally, we related changes in perceptions of the pandemic (between the first and second wave of the pandemic) to changes in the perceptions of life's finitude. Hereby, we expected increasingly burdensome perceptions of the pandemic to come along with the perception of an increasingly finite and constrained life. Furthermore, we hypothesized that changes in perceptions of the finitude of life would be stronger for older than for younger adults. Specifically, older adults might rather accommodate their perceptions of finitude in response to the pandemic (e.g., more limited future time perspective), whereas younger adults would rather maintain their perceptions of finitude. Lastly, we explored the interrelations between the different psychological constructs of the finitude of life.

Method

Procedure

Data come from a coronavirus-centered online study conducted at the Institute of Psychogerontology at the University of Erlangen-Nuremberg. Participants were recruited via email distributors of our institute, local newspaper articles, and social media postings. Participants were furthermore encouraged to distribute the study link themselves. Between March 31 and April 30 2020, the first online assessment took place and covered the first peak of the coronavirus pandemic in Germany. After five smaller online assessments which focused on a subset of time-varying variables, the second major assessment took place between November 20 and December 31 2020. This time period reflects the (beginning of the) second peak of the coronavirus pandemic in Germany. The data from the two major assessments thus allowed to investigate trajectories between the first and second peak of the pandemic.

The first assessment took participants around 25 minutes to complete, the second assessment around 50 minutes. Both assessments covered topics such as health worries and health behavior, other preparatory behavior, psychological well-being, future and

aging perspectives, and pandemic-specific constructs. As an incentive, participants received a descriptive summary of the results after data collection had finished. At the second assessment a reimbursement of 15€ was offered, as funding had meanwhile been available. All assessments received approval of compliance with ethical rules and data security law by a governmental authority of the State of Bavaria (Germany).

Sample

Between March 31 and April 30 2020, 2332 individuals participated in our coronavirus-centered online study. 87% of those participants (N = 2053) provided contact details for continued participation. Out of those, 51% (N = 1042) participated in the measurement wave taking place between November 20 and December 31 2020. A logistic regression indicated that continued participation was mostly explained by an older age (b = .01, SE = .00, p < .001; *Mc Fadden's* R^2 = 8.6%). A lower death anxiety, a more limited future time perspective, and low perceived severity were also weakly related to continued participation ($b_{Death\ Anxiety}$ = -.03, SE = .01, p = .008; $b_{Future\ Time\ Perspective}$ = -.02, SE = .01, p = .007; $b_{Severity}$ = -.02, SE = .01, p = .011; Δ*Mc Fadden's* R^2 = 0.5%). All other study variables and demographics were unrelated to continued participation. The time interval between the first and second assessment ranged from 7.0 to 9.2 months (M = 7.9, SD = 0.3).

The final sample used for analyses thus comprised 1042 individuals. The age of the participants ranged from 18 to 95 years (M = 59.1 years, SD = 16.8 years), 68% were women, 31% were men, and 1% indicated their gender as non-binary. 60% of participants reported a university degree and 33% reported another form of post-secondary education (e.g., apprenticeship). 66% were in a stable relationship and 31% were living alone. 17% of participants reported that at least one of their parents had immigrated to Germany. At the second assessment, 26 participants (2%) reported a current or past infection with SARS-CoV-2 and altogether 24% reported current or past infections with the virus in their close social environment.

Prepandemic Subsample. Solely for illustrative purposes and to ease the interpretation of our main findings, we made use of a subsample of 173 participants who had already participated in a comparable prepandemic study in late 2018 (Kim-Knauss & Lang, 2020). The overlap of study participants was originally unintended but emerged

from the usage of email distributors of our institute as a recruitment strategy for both studies. Members of the prepandemic subsample were identified by using a highly distinctive nine-digit code (participants were informed that these codes would be used for matching questionnaires). The demographics of the prepandemic sample were highly comparable to the ones of the full sample. Age ranged from 24 to 95 years (M = 61.1 years, SD = 16.6 years) in 2020, 74% were women, 26% were men. 64% of the participants reported a university degree and 34% reported alternative post-secondary education. 59% were in a stable relationship and 42% were living alone. 16% of participants reported that at least one of their parents had immigrated to Germany. The time interval between the 2018 and the first 2020 assessment ranged from 15.5 to 19.0 months (M = 18.1 months, SD = 0.6 months).

Measures

Psychological Constructs targeting the Finitude of Life. The different perceptions of finitude were assessed at the first, second, and prepandemic assessment. Future time perspective was assessed with the 10-item scale by Carstensen & Lang (1996). Individuals indicated their agreement with items such as "My future seems infinite to me" on a scale ranging from *does not apply at all* (1) to *applies very much* (7). Following Rohr and colleagues (2017), we used exploratory structural equation modeling (ESEM) to test for the underlying factor structure of the future time perspective scale. Hereby, we simultaneously modeled a factor structure over both measurement points. A one-factor solution showed an insufficient fit to the data ($RMSEA$ = .116, CFI = .801, TLI = .775, Chi^2 (190) = 12044.22). A three-factor solution however fit the data much better ($RMSEA$ = .052, CFI = .967, TLI = .955, Chi^2 (138) = 527.82). Going with the solution by Rohr and colleagues (2017), the factor *Future Time Opportunity* is made up of items 1, 2, 3, and 7 (Cronbach's α = .90 and .93), the factor *Future Time Extension* is made up of items 4 to 6 (Cronbach's α = .76 and .77), and the factor *Future Time Constraint* is made up of items 8 to 10 (Cronbach's α = .79 and .82). Higher scores on the respective component indicate stronger perceptions of future time opportunity, extension, and constraint.

Death anxiety was assessed with the single item "When I think of my own death, I become fearful". Participants indicated their agreement on a scale ranging from *I strongly disagree* (1) to *I strongly agree* (7). The item proved to be sufficiently stable over the eight months of our longitudinal assessment (r = .75, p < .001) and exhibited a strong cross-

sectional correlation to the Brandtstädter death acceptance scale, which was only assessed at the second measurement point (r = -.71, p < .001; Brandtstädter et al., 1997).

Ideal life expectancy was assessed with the question "To what age would you like to live?" (Lang & Rupprecht, 2019). We restrained extremely high answers to this question by reminding participants that the longest human lifespan verified is 122 years and asked them to not give particularly unrealistic answers. Following the procedure of Rupprecht & Lang (2020), we excluded answers that were lower than the age the respective participant had already reached (N = 2 at the second assessment; N = 1 in the prepandemic sample). We furthermore adapted extreme values greater than 125 to 125 years (N = 12 at the first assessment; N = 7 at the second assessment).

Perceptions of the Pandemic. Perceptions of the pandemic were assessed at the first and second assessment. Susceptibility of a potential SARS-CoV-2 infection was assessed with the question "In your opinion, how likely is it that you will contract the new coronavirus within the next four weeks?" and answered with a slider the participant could move from *completely unlikely (0%)* to *completely likely (100%)*. Severity was assessed with the question "In case of an infection: How would you expect the COVID-19 disease to progress?" on a scale ranging from *harmless* (1) to *severe* (7). Participants who reported a current or prior infection with SARS-CoV-2 were not asked for perceptions of susceptibility and severity. Apart from the directly disease-related constructs, we also asked for social and financial restrictions during the pandemic with the items "Due to the coronavirus and the current political and legal measures my social contacts are/my financial situation is…" on a scale ranging from *not at all restricted* (1) to *heavily restricted* (5).

Covariates. As covariates, we investigated age, gender, health, and socioeconomic status. Age was calculated as years from birth and gender was coded as *female or non-binary* (0) and *male* (1). The 8 non-binary individuals were grouped with women. Excluding the non-binary individuals from the analyses or grouping them with men did not change the results. To assess the health status of an individual, we asked for the presence of nine diagnoses—many of them risk factors for a more severe pathology of COVID-19 (e.g., diabetes, cardio-vascular diseases, pulmonary diseases). The number of self-reported diagnoses could range from 0 to 9. Socioeconomic status was assessed with the German version of the MacArthur Scale of Subjective Socioeconomic Status (Adler et

al., 2000; Hoebel et al., 2015), a ten-level ladder reflective of the German society on which individuals place themselves according to their subjective socioeconomic standing. Age, gender, health, and socioeconomic status might all influence how individuals perceive and deal with the threat of COVID-19 (Barber et al., 2020; Xiong et al., 2020). All covariates stem from the first assessment.

Analytic Strategy

We start the result section by focusing on descriptive and illustrative findings. Next to means, standard deviations, and correlations in our main sample, we present time trends in the five target constructs of future time opportunity, future time extension, future time constraint, death anxiety, and ideal life expectancy for the main sample and the prepandemic subsample. This allows for a first impression of stability and change in perceptions of finitude before and during the pandemic. After this, we present (latent) change score analyses in the main sample. We used latent variable modeling for the constructs of future time opportunity, future time extension, and future time constraint. We used manifest variable modeling for the single item indicators. First, we modeled intercept and change in the five target constructs between the first and second peak of the pandemic. Supplementary, we investigated age group differences in those intercepts and change scores. Second, we predicted the intercepts in the five target constructs with the four covariates and the initial perceptions of the pandemic (severity, susceptibility, social restrictions, financial restrictions reported at the first assessment). Third, we predicted the change scores in the five target constructs with covariates, initial perceptions of the pandemic, as well as changes in perceptions of the pandemic between the first and second assessment. Modeling change scores in perceptions of the pandemic and using them as predictors of change scores in the perceptions of finitude allowed us to capture the highly dynamic experiences of single individuals within the pandemic. Fourth, we explored interrelations between initial levels and change scores of the five psychological constructs of the finitude of life. For analyses we used Mplus 8.5 (Muthén & Muthén, 1998-2017) and R 4.0.0 (R Core Team, 2020) with the packages devEMF, psych, and lavaan (Johnson, 2020; Ravelle, 2019; Rosseel, 2012). To deal with single missing values within the (latent) change score models, we used full information maximum likelihood estimation.

Using Monte Carlo simulations as suggested by Zhang and Liu (2018) and as implemented in the R package RAMpath (Zhang et al., 2015), we estimated the power to

detect small-sized effects in our univariate and multivariate (latent) change score models. For the power simulations, we used means, variances, and reliability coefficients from the first assessment as well as stability coefficients between the first and second assessment. Next, we simulated small change (d = 0.10) and small interrelations between intercepts and change scores in univariate as well as multivariate models. Power estimates for most parameters were equal or close to 1.000. Most importantly, the power for detecting small change (d = 0.10) amounted to 1.000 for all five target constructs. As expected (Zhang & Liu, 2018), power coefficients were lowest for interrelations between intercepts and change scores and for interrelations among various change scores. Nevertheless, power simulations indicated adequate power (>= .896) to detect interrelations of the size r = .15. We were hence confident that data stemming from our main sample would allow us to detect even small effects.

Additionally, we tested whether we had adequate power for age group comparisons and ran power simulations with subsamples the size of three to four age groups. The simulations indicated adequate power to detect age group differences in intercepts and change scores. However, power was lacking to detect and adequately interpret age group differences in interrelations among various intercepts and change scores. We hence refrained from doing the latter and tested for age-group specific intercepts and change scores in the four groups of younger adults (18 to 44 years; N = 209), middle-aged adults (45 to 64 years; N = 328), young-old adults (65 to 74 years; N = 366), and old-old adults (75 to 95 years; N = 139) only in the supplement.

Results

Means, standard deviations, and bivariate correlations of the study variables are depicted in Supplementary Table S1. The severity of a potential COVID-19 disease was perceived as moderate on average and increased between the first and second assessment (M_{T1} = 3.6 and M_{T2} = 4.0; t(998) = 11.68, p < .001, d = .37). At both assessments, higher severity was linked to an older age, worse health, weaker future time opportunity, weaker future time extension, stronger future time constraint, and higher death anxiety. Perceived susceptibility was operationalized as the subjective probability of infection with SARS-CoV-2 within the next four weeks and slightly decreased between the two assessments (M_{T1} = 36.7 and M_{T2} = 34.8; t(996) = -2.24, p = .025, d = -.07). At both

assessments, higher susceptibility was linked to higher perceived severity, younger age, female gender, lower socio-economic status, and higher death anxiety.

Social restrictions due to the pandemic were perceived as strong but slightly decreased between the first and second assessment (M_{T1} = 4.1 and M_{T2} = 3.9; $t(1039)$ = -7.42, p < .001, d = -.24). At both assessments, social restrictions were perceived more strongly by women, individuals reporting stronger future time constraint, higher death anxiety, and higher susceptibility. Financial restrictions were perceived as rather weak and decreased between the first and second assessment (M_{T1} = 1.9 and M_{T2} = 1.6; $t(1039)$ = -7.69, p < .001, d = -.24). At both assessments, financial restrictions were perceived more strongly by younger individuals, and individuals reporting a lower socio-economic status, higher susceptibility, and stronger social restrictions.

Trajectories and Change in Perceptions of Finitude

Table 4.1 depicts the parameters of the basic (latent) change score models for future time opportunity, future time extension, future time constraint, death anxiety, and ideal life expectancy. Changes between the first and second peak of the pandemic are furthermore depicted in Figure 4.1. In order to enrich and illustrate the trajectories in the main sample, trajectories are also depicted for the smaller prepandemic subsample.

For *future time opportunity*, the change between the first and second peak of the pandemic was non-significant (see Table 4.1). Data from the prepandemic subsample however suggest a rather continuous decrease (Figure 4.1a). Age-group specific analyses (Supplementary Table S2) suggest that future time opportunity was only stable for the main sample's younger and middle-aged participants but did decrease for its young-old and old-old participants. *Future time extension* and *future time constraint* changed significantly between the first and second peak of the pandemic, meaning that future time extension decreased, whereas future time constraint increased (see Table 4.1). Figures 4.1b and 4.1c depict the respective trajectories and indicate that the changes seemingly followed a period of stability up until the beginning of the pandemic in the prepandemic subsample.[2] Among the three subcomponents, future time constraint exhibited the most

[2] Exploratory paired t-tests in the prepandemic subsample indicated that the (estimated) rate of yearly change differed significantly before and after March/April 2021 for future time constraint, $t(129)$ = -1.98, p = .049, and death anxiety, $t(131)$ = 3.56, p < .001. Results were only at trend level for the other constructs. Due to the small size of the prepandemic subsample and large standard deviations in the change coefficients, these analyses need to be interpreted with caution.

Table 4.1

Change Score Models for Future Time Opportunity, Future Time Extension, Future Time Constraint, Ideal Life Expectancy, and Death Anxiety.

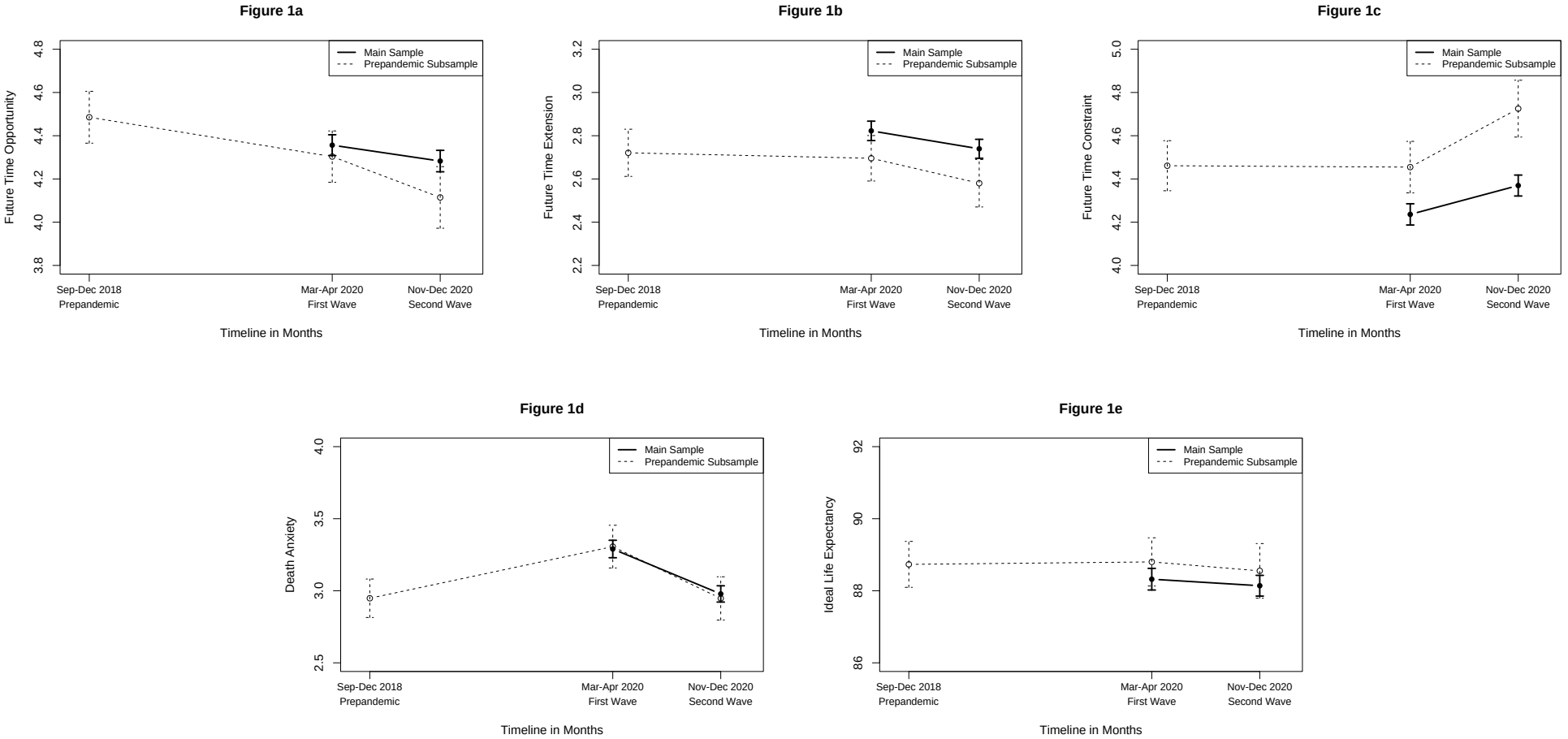
	Future Time Opportunity	Future Time Extension	Future Time Constraint	Death Anxiety	Ideal Life Expectancy
Intercept	4.58 (0.05) ***	2.73 (0.05) ***	3.69 (0.11) ***	3.29 (0.06) ***	88.32 (0.30) ***
Intercept Variance	2.54 (0.12) ***	1.46 (0.13) ***	1.49 (0.09) ***	3.82 (0.17) ***	93.66 (4.10) ***
Change	-0.07 (0.04)	-0.07 (0.03) *	0.11 (0.04) **	-0.31 (0.04) ***	-0.16 (0.18)
Change Variance	1.20 (0.07) ***	0.47 (0.05) ***	1.10 (0.08) ***	1.77 (0.08) ***	31.85 (1.40) ***
Covariance	-0.55 (0.07) ***	-0.28 (0.05) ***	-0.58 (0.06) ***	-1.14 (0.09) ***	-19.21 (1.81) ***

Notes. Unstandardized estimates for intercept and change, their variances, and their covariance are depicted with standard errors in parentheses. Latent change score models are reported for future time opportunity, future time extension, and future time constraint. Manifest change score models are reported for death anxiety and ideal life expectancy.

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

Figure 4.1

Trajectories in future time opportunity, future time extension, future time constraint, ideal life expectancy, and death anxiety during the coronavirus pandemic.



Notes. Mean values are depicted with their standard errors. The main sample consists of N = 1042 individuals. The prepandemic subsample consists of N = 173 individuals. Scales range from 1 to 7 for future time opportunity, future time extension, future time constraint, and death anxiety. Ideal life expectancy is depicted in years.

pronounced mean-level change as well as the lowest rank-order stability between the two main assessments with $r = .57$, $p < .001$ ($r = .75$ for future time opportunity and extension, $p < .001$; see Supplementary Table S1). In summary, the analyses suggest that the future time perspective of individuals became somewhat more limited between the first and second wave of the pandemic.

Figure 4.1d indicates that *death anxiety* decreased significantly between the first and second wave of the pandemic (also see Table 4.1). Data from the prepandemic subsample suggest that this decrease followed an elevation of death anxiety at the beginning of the pandemic.[2] Lastly, the construct of *ideal life expectancy* exhibited mean-level stability in the main sample and the prepandemic subsample (see Figure 4.1e and Table 4.1). Ideal life expectancy's mean-level stability was underlined by a high rank-order stability of $r = .82$, $p < .001$.

Perceptions of Finitude and Perceptions of the Pandemic

In our main analyses, we associated intercepts and (latent) change scores of the five perceptions of finitude with perceptions of severity, susceptibility, social restrictions, and financial restrictions concerning the coronavirus pandemic (see Table 4.2). The regression analyses regarding the respective intercept reflect relationships at the beginning of the pandemic. The regression analyses regarding the respective change score reflect dynamics and trajectories occurring between the first and second peak of the pandemic in Germany.

At the beginning of the pandemic, a weaker future time opportunity was associated with an older age, worse health, lower socio-economic status, and higher perceived severity of a potential coronavirus disease. A further decrease in future time opportunity was predicted by an older age (also see Supplementary Table S2), a lower socio-economic status, and an increase in severity. When individuals were thus perceiving a potential infection with the virus as increasingly severe, their future time opportunity tended to decrease.

At the beginning of the pandemic, a weaker future time extension was related to an older age, worse health, lower socio-economic status, and stronger perceptions of severity and marginally to financial restrictions, $\beta = -.05$, $p = .067$. Decreases in future time

extension between the first and second peak of the pandemic were again related to an older age and increases in perceived severity. Additionally, changes in future time extension were related to perceptions of susceptibility: Individuals who considered an infection as highly likely at the beginning of the pandemic presented decreases in future time extension. Also, when perceptions of susceptibility increased over time, future time extension decreased marginally, β = -.10, p = .071.

At the beginning of the pandemic, stronger future time constraint was also related to an older age, worse health, lower socio-economic status, and stronger perceptions of severity and financial restrictions. Increases in future time constraint were again predicted by an older age (according to Supplementary Table S2, increases occurred for younger, young-old, and old-old, but not for middle-aged adults), but also specifically by the perception of social restrictions. When individuals perceived strong social restrictions at the beginning of the pandemic, their future time constraint tended to become stronger. Similarly, when social restrictions were perceived to be increasing over the course of the pandemic, future time constraint tended to increase as well. Taken together, the three subcomponents of future time perspective exhibited partially comparable, but also specific relations to perceptions of the pandemic. Future time opportunity was primarily related to perceptions of severity. Future time extension was mainly related to perceptions of severity and susceptibility. Lastly, future time constraint exhibited specific relations to the perception of social restrictions.

Death anxiety—which had appeared elevated at the beginning of the pandemic—was related to a younger age, female gender, and stronger perceptions of severity, susceptibility, social restrictions, and marginally with financial restrictions, β = .06, p = .054. Decreases in death anxiety were predicted by an older age (according to Supplementary Table S2, decreases occurred for middle-aged, young-old, and old-old, but not for younger adults), lower initial perceptions of susceptibility, and marginally by decreases in susceptibility, β = .07, p = .051. Finally, ideal life expectancy was only associated with the covariates and marginally related to the perception of social restrictions, β = -.06, p = .069, thus mirroring our finding of much stability of ideal life expectancy in light of the pandemic. The desire to live a long life was hereby associated with an older age (age-group specific analyses as depicted in Supplementary Table S2 suggest a non-linear relationship with the lowest ideal life expectancies among middle-

Table 4.2

Prediction of Intercepts and Change Scores of Perceptions of Fragility with Perceptions of the Pandemic.

	Future Time Opportunity		Future Time Extension		Future Time Constraint		Death Anxiety		Ideal Life Expectancy	
Overall Model Fit	Chi^2 (104) = 484.65 ***; RMSEA = .059; CFI = .965		Chi^2 (66) = 814.77 ***; RMSEA = .104; CFI = .891		Chi^2 (66) = 235.31 ***; RMSEA = .050; CFI = .970		Chi^2 (4) = 20.57 ***; RMSEA = .063; CFI = .996		Chi^2 (4) = 3.76; RMSEA = .000; CFI = 1.000	
Prediction Intercept	*B* (SE)	β	*B* (SE)	β	*B* (SE)	β	*B* (SE)	β	*B* (SE)	β
Age	-0.03 (0.00)	-0.35***	-0.05 (0.00)	-0.68***	0.02 (0.00)	0.26***	-0.01 (0.00)	-0.10**	0.04 (0.02)	0.07*
Gender	0.04 (0.10)	0.01	0.09 (0.08)	0.03	0.07 (0.08)	0.03	-0.50 (0.13)	-0.12***	1.57 (0.65)	0.08*
Health	-0.11 (0.04)	-0.10**	-0.06 (0.03)	-0.07*	0.08 (0.03)	0.09*	-0.01 (0.05)	-0.01	-0.59 (0.24)	-0.09*
Socio-economic status	0.20 (0.03)	0.19***	0.07 (0.02)	0.08**	-0.06 (0.03)	-0.07*	0.04 (0.04)	0.03	0.64 (0.20)	0.10**
Severity	-0.13 (0.03)	-0.13***	-0.11 (0.03)	-0.14***	0.12 (0.03)	0.15***	0.24 (0.04)	0.20***	0.17 (0.22)	0.03
Susceptibility	0.00 (0.00)	0.01	0.00 (0.00)	0.01	0.00 (0.00)	0.05	0.01 (0.00)	0.08*	-0.01 (0.01)	-0.02
Social Restrictions	-0.00 (0.04)	-0.00	-0.01 (0.03)	-0.01	0.06 (0.04)	0.05	0.13 (0.06)	0.07*	-0.52 (0.29)	-0.06
Financial Restrictions	-0.05 (0.04)	-0.04	-0.06 (0.03)	-0.05	0.07 (0.03)	0.07*	0.10 (0.05)	0.06	0.01 (0.26)	0.00
Prediction Change Score										
Respective Intercept	-0.32 (0.03)	-0.46***	-0.33 (0.04)	-0.63***	-0.46 (0.04)	-0.53***	-0.31 (0.02)	-0.46***	-0.21 (0.02)	-0.35***
Age	-0.02 (0.00)	-0.27***	-0.02 (0.00)	-0.45***	0.01 (0.00)	0.18***	-0.01 (0.00)	-0.09*	0.01 (0.01)	0.02
Gender	0.01 (0.08)	0.00	0.01 (0.06)	0.01	-0.03 (0.08)	-0.01	0.03 (0.08)	0.01	-0.38 (0.37)	-0.03
Health	0.00 (0.03)	0.01	-0.01 (0.02)	-0.01	-0.02 (0.03)	-0.02	0.01 (0.03)	0.01	-0.05 (0.14)	-0.01
Socio-economic status	0.06 (0.02)	0.09**	-0.01 (0.02)	-0.02	-0.01 (0.02)	-0.01	0.03 (0.03)	0.03	-0.00 (0.11)	-0.00
Severity	-0.03 (0.03)	-0.05	-0.00 (0.02)	-0.01	0.03 (0.03)	0.05	0.00 (0.03)	0.00	-0.11 (0.14)	-0.03
Susceptibility	-0.00 (0.00)	-0.01	-0.00 (0.00)	-0.13*	0.00 (0.00)	0.04	0.00 (0.00)	0.08*	-0.01 (0.01)	-0.04
Social Restrictions	-0.04 (0.04)	-0.04	-0.03 (0.03)	-0.05	0.15 (0.04)	0.15***	0.03 (0.04)	0.02	0.13 (0.18)	0.02
Financial Restrictions	0.02 (0.04)	0.03	-0.01 (0.03)	-0.02	0.01 (0.04)	0.01	-0.02 (0.04)	-0.02	0.11 (0.17)	0.02
Change Severity	-0.09 (0.03)	-0.09*	-0.08 (0.03)	-0.14**	0.06 (0.03)	0.06	0.02 (0.04)	0.02	-0.13 (0.17)	-0.03
Change Susceptibility	-0.00 (0.00)	-0.03	-0.00 (0.00)	-0.10	0.00 (0.00)	0.07	0.00 (0.00)	0.07	-0.01 (0.01)	-0.06
Change Social Restr.	-0.01 (0.04)	-0.01	-0.01 (0.03)	-0.02	0.11 (0.04)	0.11**	0.04 (0.04)	0.03	0.01 (0.18)	0.00
Change Financial Restr.	-0.07 (0.04)	-0.06	-0.03 (0.03)	-0.04	0.06 (0.04)	0.06	-0.02 (0.04)	-0.01	-0.19 (0.19)	-0.04

Notes. RMSEA = Root mean square error of approximation; CFI = Comparative fit index. Fit indices, unstandardized regression weights with standard errors in parentheses, and standardized regression weights are reported (N = 1042). Latent and manifest constructs were allowed to covary. Social restrictions and financial restrictions refer to restrictions in response to the coronavirus pandemic.

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

aged adults), male gender, better health, a higher socioeconomic status, as well as marginally with weaker social restrictions.

Interrelations between the Psychological Constructs of Finitude

We additionally explored interrelations between the intercepts and change scores of the different psychological constructs assessing perceptions of finitude (Supplementary Figure S3). We found significant interrelations between all five constructs at the beginning of the pandemic. Interrelations were moderate to strong between the three subcomponents of future time perspective, and weak to moderate for death anxiety and ideal life expectancy. Specifically, a higher death anxiety was related to weaker future time opportunity, weaker future time extension, stronger future time constraint, and a higher ideal life expectancy. A higher ideal life expectancy was furthermore related to stronger future time opportunity, stronger future time extension, and weaker future time constraint.

As would be expected, changes in the three subcomponents of future time perspective were interrelated (see Supplementary Figure S3). Future time extension exhibited reciprocal relationships with both future time opportunity, and future time constraint. The three components of future time perspective did not predict changes in death anxiety and ideal life expectancy. Instead, an initially higher death anxiety predicted decreases in future time opportunity and increases in future time constraint. Furthermore, an initially higher ideal life expectancy predicted increases in death anxiety, future time opportunity, and future time extension. Changes in ideal life expectancy were also positively related to changes in future time extension.

Discussion

We investigated how perceptions of the finitude of life were affected by perceptions of the coronavirus pandemic both at the beginning and up until the second peak of the pandemic in Germany. We found significant mean-level change in future time extension, future time constraint, and death anxiety with a tendency of more stability among younger adults (future time opportunity only exhibited mean-level change among older adults). Except for ideal life expectancy, the perceptions of finitude were all related to perceptions of the pandemic cross-sectionally and longitudinally. Although the effects

we found were mostly small in size, our data provide first evidence for a changing outlook on the finitude of life due to the pandemic. In the following, we will first discuss the results for each psychological construct of finitude, before we highlight the role of chronological age and the broader implications of our research.

The Coronavirus Pandemic and Future Time Perspective

As expected, we found that future time perspectives decreased between the first and second peak of the pandemic in Germany. Specifically, future time extension decreased and future time constraint increased on average. Future time opportunity only decreased among older adults. At least partly, those changes seem attributable to the pandemic and to differing perceptions of it. Particularly, individuals who anticipated a potential disease as more severe, perceived more limited future time perspectives at the beginning of the pandemic. Individuals who perceived a potential disease as increasingly severe over time, furthermore reported decreasing future time opportunity and decreasing future time extension. This is in accordance with prior literature showing that actual and imagined health decline is associated with a narrowing future time perspective (Kellough & Knight, 2012; Kooji & Van de Voorde, 2011; Korff & Biemann, 2020; Strough et al., 2019). Even after controlling for age and health, perceiving the coronavirus as a serious health threat might thus constitute an experience of vulnerability and strengthen the perception of a finite and fragile life and future.

Future Time Opportunity. Future time opportunity—the perception of possibilities in one's future—exhibited a (continuous) decrease in the prepandemic subsample and among the two age groups of young-old and old-old adults in the main sample. Next to an older age, this decrease was related to a lower socio-economic status at the beginning of the pandemic and to perceiving the coronavirus as an increasingly serious health threat. The decrease in future time opportunity found among older and economically disadvantaged individuals could be related to factors associated with the pandemic (e.g., the shrinkage of resources and opportunities particularly among those individuals). It may however also reflect processes independent from or exacerbated by the pandemic. For example, Strough and colleagues (2016) found non-linear age trends in the perception of future time opportunity, suggesting an accelerated decrease of future time opportunity among older adults outside of the pandemic.

Future Time Extension. In the prepandemic subsample, future time extension—the perception of how much time remains in one's life—appeared stable between 2018 and the beginning of the pandemic and marginally decreased afterwards. This decrease between the first and second wave of the pandemic was significant in the main sample. An (increasingly) limited future time extension was hereby primarily related to an older age, and strong perceptions of severity and susceptibility. Perceiving oneself as vulnerable to the virus (due to high severity and susceptibility) should directly threaten the life of individuals and affect perceptions of its extension and finitude. When an infection with the potentially deadly virus was perceived as (increasingly) likely or even inevitable, this contributed to a shrinking future time extension.

Future Time Constraint. Future time constraint—the perception of limitations in one's future—significantly increased between the first and second peak of the pandemic. This increase followed a period of stability in the prepandemic sample, suggesting that the lasting pandemic lead to an accumulation of future time constraints. The increase in future time constraint was primarily predicted by the experience of (increasing) social restrictions. Restrictions in everyday social relationships are likely experienced as losses that affect the anticipation of the future beyond the pandemic. Social restrictions may block certain long-term goals (e.g., finding a new romantic partner), take away resources (e.g., social support offered by in-person meetings), and contribute to the overall anticipation of a finite and fragile future and life. Although practically reversed, these findings can be related to socioemotional selectivity theory according to which the perception of a finite life is associated with changing goals and priorities in the socioemotional domain, as well as the restriction of social networks to emotionally close relationships (Lang & Carstensen, 2002).

The Coronavirus Pandemic and Death Anxiety

Whereas changes in future time perspective seemed to appear predominantly between the first and second wave of the pandemic and thus likely due to its lasting impact, death anxiety appeared elevated at the very beginning of the pandemic. Data from the prepandemic subsample suggest an increase in death anxiety between 2018 and the onset of the pandemic. By the second wave of the pandemic, death anxiety had again decreased to its prepandemic level. This finding is emphasized by data from the main sample and the close relationship between death anxiety and initial perceptions of the

pandemic. Death anxiety namely appeared highly reactive and was initially related to stronger perceptions of severity, susceptibility, social restrictions, and (marginally) financial restrictions. The decrease in death anxiety between the first and second wave of the pandemic was related to perceptions of (decreasing) susceptibility. These findings are in accordance with terror management theory, which suggests that elevated death anxiety is encountered by various coping mechanisms targeting the awareness of vulnerability, fragility, and mortality (Solomon et al., 1991). By the second wave of the pandemic, most individuals would thus have found strategies to lower their personal death anxiety. This may particularly be the case for older as opposed to younger adults (see Table 4.2 and Supplement). However, an initially higher death anxiety was influential over time as it slightly contributed to an increase in future time constraint and a decrease in future time opportunity.

The Coronavirus Pandemic and Ideal Life Expectancy

Ideal life expectancy exhibited high mean-level and rank-order stability during the pandemic. An initially higher ideal life expectancy was explained by an older age, male gender, better health, and a higher subjective socio-economic status. Lasting influences embedded in an individual's biography thus seemed more decisive for ideal life expectancies than temporal experiences of vulnerability or shrinking resources. Apart from the availability of resources (Brandão et al., 2019), theory suggests enduring belief systems and mindsets as antecedents of ideal life expectancies (Lang & Rupprecht, 2019). Such belief systems are likely only affected in the long-term or during particularly formative periods of life.

Ideal life expectancy as a more stable construct also had effects on the other psychological constructs of finitude over time. A higher ideal life expectancy led to increases in future time opportunity and future time extension. The wish for a longer life might thus open up individuals' future time perspectives, particularly during a threatening time period such as a global pandemic. Furthermore, a higher ideal life expectancy predicted increases in death anxiety, suggesting that individuals wishing for a longer life might feel particularly anxious once this longer life is threatened as during the pandemic or other periods of heightened death awareness (Cicirelli, 2006).

Chronological Age and Perceptions of the Finitude of Life

Initial relations between chronological age and the five perceptions of finitude were as expected: An older age was related to weaker future time opportunity, weaker future time extension, stronger future time constraint, lower death anxiety, and higher ideal life expectancies. Older age predicted stronger changes in all psychological constructs of finitude except for ideal life expectancy. Age-group specific analyses in the supplement support this finding of more reactive and accommodating perceptions of life's finitude in older age. This is in accordance with the dual-process framework (Brandtstädter & Rothermund, 2002), which suggests that older adults would rather accommodate in response to life's changes, whereas younger adults would rather maintain their stance towards life's finitude. Cohort differences might add to these explanations. Older adults typically experience more reminders of their own mortality on a day-to-day basis (Maxfield et al., 2007) and have likely gone through several periods of major societal change throughout their lives. In contrast, many younger Germans' believes in an extended future had rarely been challenged before the pandemic. Whereas younger adults might thus be more tenacious and persistent in their perceptions of an extended future, older adults may respond to the pandemic, its challenges, and its amplification of the finitude and fragility of life in more accommodating ways.

For a more explicit test of the dual-process framework, age should be investigated as a moderator in the relationship between perceptions of the pandemic and perceptions of finitude. Unfortunately, our study design did not provide adequate statistical power for such calculations. Recent research indeed indicates that individuals of different ages respond to the pandemic in distinctive ways (Barber & Kim, 2020; Carstensen et al., 2020; Pearman et al., 2020). An alternative explanation may however be that age-specific experiences throughout the pandemic mediate and explain age-specific change. Future research should more explicitly target the decreasing future time perspectives of older adults during the pandemic, but also the continuously high death anxiety found among the youngest participants.

Outlook and Future Research

As our research provided first evidence that perceptions of the finitude of life may change during and due to the pandemic, future research should follow up on those findings and investigate the impact and consequences of this change, additional antecedents, its potentially lasting impact, and its transferability to other contexts.

Following predictions of socioemotional selectivity theory (Carstensen et al., 1999) and terror management theory (Pyszczynski et al., 1999), changes in perceptions of finitude could be associated with shifting goals and priorities, behavior changes, and decreases in mental health (also see Brandtstädter et al., 2010). Individual decreases in future time perspective due to the pandemic could result in declines in psychological well-being (Grühn et al., 2016), and shifting priorities from long-term, instrumental, and knowledge-related goals to short-term and emotionally meaningful goals (Carstensen et al., 1999; Lang & Carstensen, 2002). Increases in death anxiety could contribute to mental illness (Menzies et al., 2019) and could be associated with maladaptive behavior during the pandemic such as the denial of the virus' threat or the implementation of behaviors strengthening one's worldview (Courtney et al., 2020; Pyszczynski et al., 1999). In extreme cases, this strengthened worldview could be an ideology that disregards scientific expertise (Perry et al., 2020). Continuously high ideal life expectancies might motivate individuals to invest in health behaviors (Bowen et al., 2020) and could also be associated with pandemic-specific health behaviors. As shown in our analyses, ideal life expectancies might also impact other psychological constructs of finitude.

As we could only partly explain initial levels and changes in psychological constructs of finitude, future research should focus on additional pandemic-related antecedents of change such as personal experiences with the virus, the repeated exposure to (depictions of) serious illness and changing contexts for dying and death. Other important research questions concern the further development and aftermath of the pandemic: Would vaccinations affect perceptions of the finitude of life and potentially expand them? Would changes in perceptions of finitude persist, intensify, or vanish in the long-term? And would such effects and consequences depend on the age of individuals? In general, larger samples with multi-wave pre- and postpandemic data will allow to investigate patterns of change before and after the onset of the pandemic and to more systematically test the presence of a "COVID-19 effect" (Wettstein & Wahl, 2021). Lastly, the question arises whether our results are transferable to contexts outside of the pandemic. Hereby, the pandemic's societal and communal aspect might be decisive. In contrast to more personal changes, challenges, and problems, the coronavirus pandemic is very much a joint responsibility. This allows for communal coping next to individual coping (Lyons et al., 1998) as well as social support and cohesion (Tull et al., 2020), which might dampen the threat posed by COVID-19 on the single individual.

Limitations

The first limitation pertains to the selectivity of our samples and the generalizability of our results. By openly advertising our online study we might have generated a sample of individuals highly interested, but potentially less affected by the pandemic. Additionally, there was selective attrition in our dataset as younger adults were less likely to remain in the sample and to participate continuously. This could limit the representativeness of our results for this age group. The generalizability of our findings to other countries might also be limited due to the vast differences in the handling and impact of the pandemic in different parts of the world. The situation in Germany was relatively representative for the overall situation in Europe, differences to other continents were however pronounced (Our World in Data, 2021). Future research may investigate whether higher caseloads and death rates in other countries could be associated with stronger changes in perceptions of finitude. In contrast, prior regional experiences with epidemics and pandemics (e.g., Ebola or SARS) might dampen the effect of the recent pandemic. A second limitation refers to the usage of single-item measures for the assessment of death anxiety and the perceptions of the pandemic. The single item measuring death anxiety has not been validated in prior research. The item asking for social restrictions in response to the pandemic did not explicitly differentiate between legally-mandated social restrictions and self-imposed social restrictions. In contrast to mandatory social restrictions, deliberate ones might have different consequences. A third limitation refers to the insufficient fit indices of the model for future time extension. Reasons for this could be the particularly broad age range of our sample (18 to 95 years) or context-specific aspects like the pandemic.

Conclusion

Overall, we found that perceptions of the finitude of life slightly changed in the face of global societal change and a life-threatening pandemic. Whereas death anxiety appeared accentuated at the beginning of the pandemic, future time perspectives decreased over the course of it with more pronounced changes among older adults. The effects of the pandemic on psychological constructs of finitude did hereby not only stem from the threat the coronavirus posed itself, but also from social and financial restrictions experienced due to the pandemic. Future research may want to focus on the potentially

far-reaching consequences that changing perceptions of finitude entail for personal goals, life planning, behavior, and well-being.

5

Aging-Related Fears and their Associations with Ideal Life Expectancy

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ORIGINAL INVESTIGATION

Aging-related fears and their associations with ideal life expectancy

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Abstract
Fears regarding various aspects tend to stimulate individuals to escape or to avoid the sources of the threat. We concluded that fears associated with the future aging process, like the fear of aging-related diseases, the fear of loneliness in old age, and the fear of death, would stimulate patterns of avoidance when it comes to ideal life expectancy. We expected fear of aging-related diseases and fear of loneliness in old age to be related to lower ideal life expectancies. We expected fear of death to be related to higher ideal life expectancies. In two adult lifespan samples [$N_1 = 1065$ and $N_2 = 591$; ages ranging from 18 to 95 years, M (SD)$_1 = 58.1$ (17.2) years, M (SD)$_2 = 52.6$ (18.1) years], we were able to support our hypothesis regarding fear of death. We furthermore found significant interactions among the fears, indicating that individuals fearing diseases or loneliness but being unafraid of death opted for the shortest lives. Our results indicate that fears regarding life in very old age might be associated with the wish to avoid this age period; the fear of death was however associated with the wish for particularly long lives, and thus, with distancing oneself from the dreaded event of death. We conclude that fears seem to be associated with how individuals approach old age and with what they wish for in their own future as aged people.

Keywords Ideal life expectancy · Longevity desires · Fear of death · Aging-related fears

Introduction

As the number of nonagenarians and centenarians is continuously rising around the world (Stepler 2016), absolute and relative numbers of retirees are growing, and diseases and disabilities are increasingly occurring in oldest age (GBD 2019 Diseases and Injuries Collaborators 2020), it becomes particularly important to understand how people envision very old age and whether they would like to reach a high age themselves. When being asked for their ideal life expectancy, the vast majority of participants in European and Northern American studies wish to experience early old age or *third age* (Ambrosi-Randić et al 2018; Bowen et al 2020; Chopik et al 2018; Lang et al 2007). This age period describes the part of an individual's old age that is characterized by high levels of psychological, physical, and social well-being (oftentimes up to the ages of 75 or 80 years; Baltes and Smith 2003). Fewer individuals however wish to reach very old age or *fourth age* (Bowen and Skirbekk 2017; Lang et al 2007), which is the period of an individual's old age associated with higher levels of frailty, multimorbidity, loneliness, and dependency (mostly 80 years and older; Baltes and Smith 2003). An important explanation for why some individuals limit their ideal life expectancy might thus be fears regarding living conditions in very old age. The current paper focuses on the interplay between different aging-related fears and the construct of ideal life expectancy.

Ideal life expectancy can be defined as a personal and relatively stable desire regarding the length of life (cf. Rupprecht and Lang 2020). It is assumed to influence actual survival (Karppinen et al 2012), engagement in health behaviors (Bowen et al 2020), and psychological well-being (Rupprecht and Lang 2020). As individuals form ideal life expectancies for an unknown and largely unforeseeable future, anticipations of the personal life in old age should be crucial (Awang et al 2019; Bowen and Skirbekk 2017).

Fears hereby refer to explicitly negative anticipations of a possible future. In contrast to generalized anxieties, fears relate to specific objects, situations, conditions, and states

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(Öhman 2008; Epstein 1972). For example, Arrindell et al (1991) identified four broad and fundamental classes of fears or phobias, that is, agoraphobic fears, fears of animals, interpersonal fears, and fears regarding death and illness (the two latter classes of fears include the aging-related fears studied within this paper). From an evolutionary perspective, fears serve the function to protect individuals from bodily, but also social and psychological harm. The most central coping mechanism to encounter fears and to protect oneself is hereby avoidance (Epstein 1972; Frijda et al 1989; Smith and Freund 2002). Individuals would thus strive to avoid the aspects of old age they fear and while a proactive way of doing so would be to engage in protective and preparatory behavior, a straightforward but passive way would be to evade the fears by wishing to not reach very old age at all. In the following, we will elaborate on this idea that specific fears regarding the aging process, that is, the fear of aging-related diseases, the fear of loneliness in old age, and the fear of death, are related to patterns of avoidance when it comes to ideal life expectancy.

Fearing aging-related diseases and ideal life expectancy

In studies investigating fears and worries regarding a future aging process, health concerns have been at the forefront of participants' minds (Neikrug 2003; Smith and Freund 2002; Wisocki et al. 1988). Accordingly, individuals regularly state good health as a condition for wanting to reach very old age (Brandão et al 2019; Ekerdt et al 2017; Karppinen et al 2016). When asked to trade-off between a shorter life in good health and a longer life in impaired health, many individuals seem to opt for the former option (Ayalon and King-Kallimanis 2010; Tsevat et al. 1998). Consequently, we previously identified a *medicalist* mindset for longevity motivation (Lang and Rupprecht 2019). The *medicalist* mindset is associated with an appreciation of longevity as long as life is healthy and characterized by good physical, cognitive, and psychological functioning. In relation to our research question, individuals particularly afraid of illness and aging-related diseases (e.g., dementia and stroke) might be more hesitant in wishing to reach very old age. A strong fear of aging-related diseases might thus be associated with lower ideal life expectancies.

Fearing loneliness in old age and ideal life expectancy

Another fear commonly associated with reaching very old age is the fear of surviving close others and of being left alone. Fears of bereavement and the explicit fear of loneliness in old age were among the main reasons why individuals did not want to live up to an age of 100 years in a study by Karppinen and colleagues (2016). Indeed, the absence of a spouse, but also the presence of functional limitations seem able to explain the heightened experience of loneliness at a very high age (Luhmann and Hawkley 2016). Particularly against the backdrop of the increasing subjective importance of close social relationships at the end of life (cf. socioemotional selectivity theory; Carstensen et al 1999), the fear of loneliness in old age might thus undermine the wish to live a particularly long life. Instead, individuals fearing loneliness in old age might prefer lower ideal life expectancies, so that when they die, central roles like their work status are still relevant and close others are still alive.

Fearing death and ideal life expectancy

As getting older is inherently associated with getting closer to the end of one's life, the fear of death might be relevant for ideal life expectancy as well. Terror management theory proposes that humans encounter the immediate threat of death by distancing themselves from it (Pyszczynski et al 1999)—for example by denying their own vulnerability (Greenberg et al 2000), or by supporting indefinite life extension (Lifshin et al. 2018, 2019). Individuals with a strong fear of death might thus try to avoid or postpone the dreaded event by wishing for particularly long lives. Indeed, a strong fear of death was related to wanting to live longer than one personally expected to in a study by Cicirelli (2006). In recent work, we observed a similar tendency for individuals with low death acceptance (Lang and Rupprecht 2019). Accordingly, we identified an *essentialist* mindset for longevity motivation, which is characterized by the strive to conjointly overcome aging, the associated biological degeneration, and death. Whereas only a minority of individuals may actually wish to overcome death completely (Partridge et al 2011), wishing for an extraordinary but still realistic length of life might be one response to a strong fear of death.

Concurrent fears and ideal life expectancy

The different fears described above can be present concurrently, might even be interdependent, and could jointly influence an individual's ideal life expectancy. Previous works found that when fears of aging (including aspects of illness and loneliness) were strong, fear of death tended to be strong as well (Benton et al 2007; Bodner et al. 2015). If aging and death were feared simultaneously, the hypothesis that fear of loneliness and fear of diseases could result in a weaker desire for a long life may no longer hold true. Instead, individuals might generally be so afraid of life's finitude (including aspects of death, disease, and loneliness) that they might wish for an overall postponed aging process and particularly long life. In contrast, when fears of aging-related diseases and loneliness in old age are strong, but fear

of death is weak, the wish to die before reaching very old age might seem like an acceptable resolution. We thus explored whether fears of diseases and loneliness on the one side and fear of death on the other side interact in their association with ideal life expectancy.

Current study

The current work explores the associations between ideal life expectancy and three different fears, that is, the fear of aging-related diseases, the fear of loneliness in old age, and the fear of death. To answer our research questions, we used two studies and samples. Study 1 focused on the fear of diseases and the fear of death in relation to ideal life expectancy. We expected a stronger fear of diseases to be related to lower ideal life expectancies, as individuals fearing aging-related diseases might wish to avoid a potentially vulnerable fourth age. In contrast, we expected a stronger fear of death to result in higher ideal life expectancies as individuals fearing death might want to distance themselves from it. Additionally, we explored the interaction of fear of diseases and fear of death in their association with ideal life expectancy.

Study 1

Method

Sample and procedure

The sample for Study 1 comes from an ongoing coronavirus-centered online study. Data collection took place in September and October of 2020, a time when coronavirus cases in Germany were slowly rising again, but there were only few measures restricting public life. Participants were recruited via email distributors of our institute, local newspaper articles, as well as postings on social media. Participants were also encouraged to promote the study within their own networks. The study received approval of compliance with ethical rules and data security law by a governmental authority of the State of Bavaria (Germany).

The sample consisted of 1085 individuals, among whom 1056 had given basic demographic information. Those 1056 participants were aged 18 to 95 years ($M = 58.1$, SD = 17.2). 70% of the participants identified as women, 29% as men, and 1% as non-binary. 65% held a university degree, 66% reported being in a stable relationship, and 26% were living alone.

Measures

Ideal life expectancy was assessed with the question "To what age would you like to live?" (Lang and Rupprecht 2019). As the longest human lifespan verified is 122 years, we asked participants to give realistic answers and adapted values greater than 125 years to a currently imaginable lifespan of 125 years ($N = 8$ or 0.8%; see Rupprecht and Lang 2020). We additionally excluded three answers, one due to a typing error and two due to lying below the current age of the participant.

Fear of death was assessed in a time-sensitive manner by asking to what extent the statement "When thinking of my own death, I became fearful" had applied to the participant during the last week on a scale ranging from 1 (*does not apply at all)* to 7 (*applies very much*).

Fear of aging-related diseases was assessed by asking participants whether they were afraid of dementia/cancer/stroke/heart attack/serious lung disease in relation to themselves (DAK-Gesundheit 2020; Martin et al 2021). The five diseases were chosen as all of them are aging-related, i.e., their prevalence clearly increases with age and the diseases particularly affect the quality of life among old and very old adults (e.g., Cho and Stout-Delgado 2020; GBD 2019 Diseases and Injuries Collaborators 2020; White et al 2014). Items were answered on a scale ranging from 1 (*not at all*) to 5 (*very much*). The five items formed a scale with good reliability, Cronbach's $\alpha = 0.84$.

Age, gender, education, life satisfaction, social satisfaction, self-rated health, and a count of medical diagnoses served as covariates to cover demographics and well-being. Several of these covariates were related to ideal life expectancy in prior research (e.g., Bowen and Skirbekk 2017; Lang et al 2007; Rupprecht and Lang 2020). Age was assessed as years since birth. Gender was coded as 0 (*female or non-binary*) or 1 (*male*). History of education and degrees were translated into ISCED categories ranging from 1 (*primary education*) to 8 (*doctoral degree*). Life satisfaction was assessed with the question "How satisfied are you with your life, all things considered?", which participants answered on a scale ranging from 0 (*completely dissatisfied*) to 10 (*completely satisfied*) (Lucas et al 2003). Social satisfaction was operationalized as the average out of two items asking participants to rate their relationship with friends/acquaintances and family on a scale ranging from 1 (*very bad*) to 5 (*very good*) (see Böger and Huxhold 2018). The two items for social satisfaction were correlated by $r = 0.29$, $p < 0.001$. For assessing self-rated health, individuals described their own health as *bad* (1), *poor* (2), *fair* (3), *good* (4), or *very good* (5). We additionally asked for the presence of nine different diagnoses—many related to the diseases we used for the fear of aging-related diseases scale (e.g., cardiovascular disease, lung disease, cancer). The number of self-reported diagnoses served as an additional health variable and could range from 0 to 9.

Table 1 Descriptive statistics and bivariate correlations for Study 1

Variable	M	SD	1	2	3	4	5	6	7	8	9	10
1. Fear of diseases	2.77	1.00	–									
2. Fear of death	2.42	1.84	0.34**	–								
3. Ideal life expectancy	87.64	10.25	−0.03	0.05	–							
4. Age	58.07	17.18	0.09*	0.06	0.07*	–						
5. Gender	–	–	−0.01	−0.03	0.11**	0.19**	–					
6. Education	5.56	1.82	−0.07*	−0.02	0.04	0.01	0.14**	–				
7. Life satisfaction	7.06	2.16	−0.16**	−0.17**	0.16**	0.14**	0.08*	0.07*	–			
8. Social satisfaction	3.87	0.87	−0.15**	−0.09*	0.11**	−0.06	0.02	0.11**	0.44**	–		
9. Self-rated health	3.70	0.91	−0.29**	−0.21**	0.12**	− 0.14**	−0.04	0.10**	0.39**	0.29**	–	
10. Diagnoses	1.53	1.38	0.24**	0.10*	−0.05	0.33**	0.08*	−0.08*	−0.15**	−0.16**	−0.52**	–

Self-rated health, social satisfaction, and fear of death were assessed on different scales in Study 1 and Study 2

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

Data analysis

Following bivariate and descriptive analyses, ideal life expectancy served as the outcome variable in a regression analysis with the covariates being entered as predictors in a first step, fear of death, and fear of aging-related diseases being entered in a second step, and their interaction in a third step. Except for gender, all predictor variables were mean-centered. R 4.0.0 (R Core Team 2020) and the packages psych, interactions, and devEMF (Johnson 2020; Long 2019; Ravelle 2019) were used for data analyses and illustration.

Results

Table 1 depicts the descriptives and bivariate correlations of the study variables. Fear of death was rather low with a mean of 2.4 (SD = 1.8) on a scale ranging from 1 to 7. Fear of aging-related diseases was moderate with a mean of 2.8 (SD = 1.0) on a scale ranging from 1 to 5. The two fears were positively related to each other ($r = 0.34$, $p < 0.001$). They were both unrelated to ideal life expectancy in the bivariate setting. Fear of death and fear of aging-related diseases were however both related to lower life satisfaction, lower social satisfaction, worse self-rated health, and a higher number of diagnoses.[1] Ideal life expectancies amounted to an average of 87.6 years (SD = 10.3; *Quartiles* = 82/87/90). A higher ideal life expectancy was significantly associated with older age, male gender, higher life satisfaction, and social satisfaction, as well as better self-rated health.

[1] When investigating the specific subgroups of childless individuals, individuals with migratory background, and individuals living alone, fear of aging-related diseases was significantly elevated among individuals living alone. Fear of loneliness in old age was significantly elevated among childless individuals and individuals with migratory background. There were no consistent patterns for fear of death.

The results of the regression analysis are depicted in Table 2. Among the covariates, a higher ideal life expectancy was related to being older, being male, reporting a higher life satisfaction, and better self-rated health. A stronger fear of death was significantly related to a higher ideal life expectancy only as long as the interaction between fear of death and fear of aging-related diseases was not part

Table 2 Regression analysis of ideal life expectancy on fears of death and diseases

Variables	Ideal life expectancy			
	β	*B*	SE(*B*)	ΔR^2
Age	0.07*	0.04	0.02	
Gender	0.09*	2.02	0.70	
Education	0.01	0.04	0.17	
Life satisfaction	0.10*	0.47	0.17	
Social satisfaction	0.04	0.49	0.40	
Self-rated health	0.09*	1.01	0.44	
Diagnoses	−0.02	−0.16	0.28	
				4.6%**
Fear of death	0.06	0.33	0.19	
Fear of diseases	0.01	0.06	0.34	
				0.6%*
Fear of death* Fear of diseases	0.08*	0.42	0.18	
				0.5%*

Ideal life expectancy is predicted by covariates, fear of death and fear of diseases, as well as their interaction term in a stepwise procedure. Standardized regression weights β, unstandardized regression weights *B*, as well as their standard errors SE(*B*) are depicted for the final model including all predictor variables. ΔR^2 and related F-tests are depicted for the single steps. In exploratory analyses neither self-rated health nor the count of diagnoses moderated the relationship between fear of diseases and ideal life expectancy

**$p < 0.001$, *$p < 0.05$

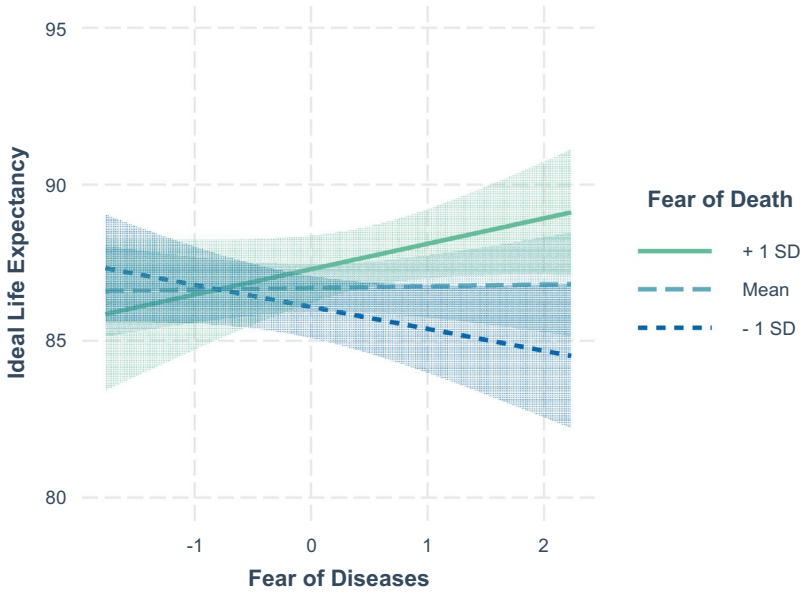

Fig. 1 Interaction of fear of death and fear of diseases in predicting ideal life expectancy

Notes. Ideal life expectancies are given in years. Values for fear of aging-related diseases are mean-centered.

of the regression analysis. The interaction reached significance and is illustrated in Fig. 1. Ideal life expectancy was lowest when fear of aging-related diseases was strong, but fear of death was weak. Ideal life expectancy was highest when both fears were strong.

Discussion of Study 1

As hypothesized, we found that a stronger fear of death was related to higher ideal life expectancies. This could reflect the wish to distance oneself from death and to push it into a more distant future. Additionally, ideal life expectancies were lowest when participants feared aging-related diseases but did not fear death. For some individuals, fears regarding certain risks of life in very old age were thus stronger than the fear of death. This combination could provoke the wish to die before reaching very old age (Bowen and Skirbekk 2017).

As these associations had not been tested in prior research and were relatively small, we seeked to validate them in a second study. Study 2 focused on fear of death and fear of loneliness in old age—another fear that targets potential risks of life in very old age (cf. Luhmann and Hawkley 2016). We again expected a positive relation between fear of death and ideal life expectancy. Following the results from Study 1, we additionally expected that ideal life expectancy would be lowest for individuals fearing loneliness in old age, but being unafraid of death. Fear of aging-related diseases and fear of loneliness in old age both target certain risks of life in very old age that individuals might be afraid of; fear of death targets death as a counterpart of life instead.

Study 2

Method

Sample and procedure

The sample for Study 2 comes from the German online study of the Aging as Future project (Rothermund et al 2012). Data included 591 adults who participated in the study in 2018 and were recruited via local and partner institutions, announcements in online platforms, as well as email distributors. The usage of the latter likely led to a small overlap of participants between Study 1 and Study 2. Participants answered questions on late-life preparation, future outlook, and subjective aging (see Kim-Knauss and Lang 2020) and were reimbursed with 20€. Participants were aged 18 to 93 years ($M = 52.6$, $SD = 18.1$). 58% of the participants were women, 42% were men, 60% held a university degree, 68% reported being in a stable relationship, 31% were living alone, and 15% reported a migratory background. Study 2 also received approval of compliance with ethical rules and data security law by a governmental authority of the State of Bavaria (Germany).

Table 3 Descriptive statistics and bivariate correlations for Study 2

Variable	*M*	SD	1	2	3	4	5	6	7	8	9	10
1. Fear of loneliness	3.44	1.81	–									
2. Fear of death	3.36	1.80	0.27**	–								
3. Ideal life expectancy	88.86	10.83	−0.10*	0.10*	–							
4. SLED	−5.45	9.73	−0.08*	−0.20**	−0.61**	–						
5. Age	52.63	18.08	− 0.17**	−0.13*	0.04	0.24**	–					
6. Gender	–	–	−0.11*	−0.09*	0.07	−0.06	−0.01	–				
7. Education	5.42	1.93	0.03	−0.01	0.01	0.03	−0.04	0.02	–			
8. Life satisfaction	7.25	2.01	−0.29**	−0.12*	0.14**	0.18**	0.27**	0.03	0.07	–		
9. Social satisfaction	5.31	1.32	−0.28**	−0.07	0.11*	0.10*	0.16**	−0.01	0.09*	0.49**	–	
10. Self-rated health	3.06	1.10	−0.11*	−0.06	0.14**	0.06	−0.27**	0.01	0.12*	0.30**	0.12*	–

SLED = subjective life expectancy discordance. Self-rated health, social satisfaction, and fear of death were assessed on different scales in Study 1 and Study 2

*$p < 0.05$, **$p < 0.001$

Instruments

Ideal life expectancy was assessed exactly as in Study 1. One value was excluded as it was below the current age of the participant and values exceeding 125 years of age were adapted to 125 ($N = 8$ or 1.4%). Participants were additionally asked about their perceived life expectancy with the question "To what age do you expect to live?" (Lang and Rupprecht 2019). This allowed us to investigate ideal life expectancies relative to what individuals would actually expect. The resulting construct of subjective life expectancy discordance (SLED) reflects the discrepancy between ideal and perceived life expectancy. It was calculated by subtracting ideal life expectancy from perceived life expectancy and adapting values lower than −50 to −50 ($N = 6$ or 1%; see Rupprecht and Lang 2020). Negative SLED scores indicated that participants wanted to live longer than they expected to. Positive SLED scores indicated that participants expected to live longer than they actually wanted to. SLED takes into account the expectations individuals have for the length of their life and interprets ideal life expectancies in the scope of them. For example, an ideal life expectancy of 75 years seems rather low in absolute terms; an associated SLED value of -10 years would however indicate that the ideal life expectancy is already 10 years higher than the perceived life expectancy of an individual. SLED thus offers an additional point of view on ideal life expectancies (cf. Rupprecht and Lang 2020), which should enrich the interpretation of our findings.

Fear of death was assessed with the single item "When I think of my own death, I become fearful". Participants could indicate their agreement on a scale ranging from 1 (*I strongly disagree*) to 7 (*I strongly agree*).

Fear of loneliness was assessed with the single item "How much do you fear being lonely in old age?". Participants answered on a scale ranging from 1 (*not at all*) to 7 (*very much*).

Age, gender, education, life satisfaction, social satisfaction, and self-rated health served as covariates. The constructs were operationalized exactly as in Study 1 with the exception of self-rated health and social satisfaction. In Study 2, individuals described their own health as *bad* (1), *poor* (2), *fair* (3), *good* (4), *very good* (5), or *excellent* (6). Social satisfaction was operationalized as the average out of the two items "How satisfied are you with your relationships with your family members?" and "How satisfied are you with your network of friends?", which were both answered on a scale ranging from 1 (*not at all satisfied*) to 7 (*very satisfied*) (Rupprecht and Lang 2020). The two items for social satisfaction were correlated by $r = 0.51$, $p < 0.001$.

Data analysis

Data analyses were conducted as described for Study 1. Next to absolute ideal life expectancy, SLED served as an additional outcome variable.

Results

Table 3 depicts the descriptives and bivariate correlations of the study variables. Fear of death and fear of loneliness were both moderate on average with means of 3.4 on scales ranging from 1 to 7. The two fears were positively related to each other, $r = 0.27$, $p < 0.001$. They were both negatively related to life satisfaction. Fear of loneliness was also related to lower social satisfaction and worse self-rated health. Both fears exhibited very small, but significant bivariate relations to ideal life expectancy. A stronger fear of loneliness in old age was related to preferring shorter life expectancies. A stronger fear of death was related to preferring longer life

Table 4 Regression analyses of ideal life expectancy and subjective life expectancy discordance on fears of death and loneliness

Variables	Ideal life expectancy				Subjective life expectancy discordance			
	β	B	SE(B)	ΔR^2	β	B	SE(B)	ΔR^2
Age	0.06	0.03	0.03		0.22**	0.12	0.02	
Gender	0.09*	1.98	0.87		−0.09*	−1.64	0.76	
Education	−0.01	−0.08	0.22		0.03	0.16	0.20	
Life satisfaction	0.06	0.29	0.27		0.07	0.34	0.24	
Social satisfaction	0.05	0.43	0.38		0.01	0.07	0.32	
Self-rated health	0.13*	1.30	0.44		0.09	0.74	0.39	
				4.3%**				8.8%**
Fear of death	0.15**	0.89	0.25		−0.16**	−0.83	0.22	
Fear of loneliness	−0.08	−0.45	0.26		0.02	0.10	0.23	
				2.3%**				2.6%**
Fear of death* Fear of loneliness	0.08*	0.25	0.13		−0.11*	−0.31	0.11	
				0.7%*				1.2%*

Ideal life expectancy and subjective life expectancy discordance are predicted by covariates, fear of death, and fear of loneliness, as well as their interaction term in a stepwise procedure. Standardized regression weights β, unstandardized regression weights B, as well as their standard errors SE(B) are depicted for the final model including all predictor variables. ΔR^2 and related F-tests are depicted for the single steps

$^{**}p < 0.001$, $^{*}p < 0.05$

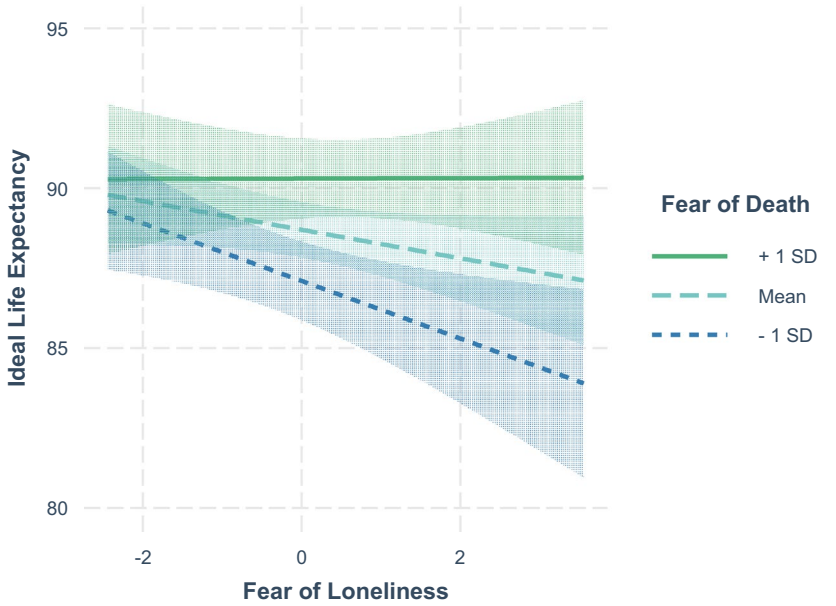

Fig. 2 Interaction of fear of death and fear of loneliness in predicting ideal life expectancy

Notes. Ideal life expectancies are given in years. Values for fear of loneliness in old age are mean-centered.

expectancies. Ideal life expectancies amounted to an average of 88.9 years (SD = 10.8; *Quartiles* = 85/90/95). Both fears also exhibited small, but significant bivariate relations to SLED. Greater fears of death and loneliness were both weakly related to wishing to live longer than one expected. The mean of SLED was −5.5 (SD = 9.7; *Quartiles* = −10/− 3.5/0), indicating that average participants wished to live 5.5 years longer than they expected to.

The results of the two regression analyses are depicted in Table 4. A higher ideal life expectancy was significantly related to being male, being in better health, and being more fearful of death. Fear of death and fear of loneliness interacted in their association with ideal life expectancy. Figure 2 shows that ideal life expectancy was lowest when fear of loneliness in old age was strong, but fear of death was weak. A more negative SLED—indicating that individuals would

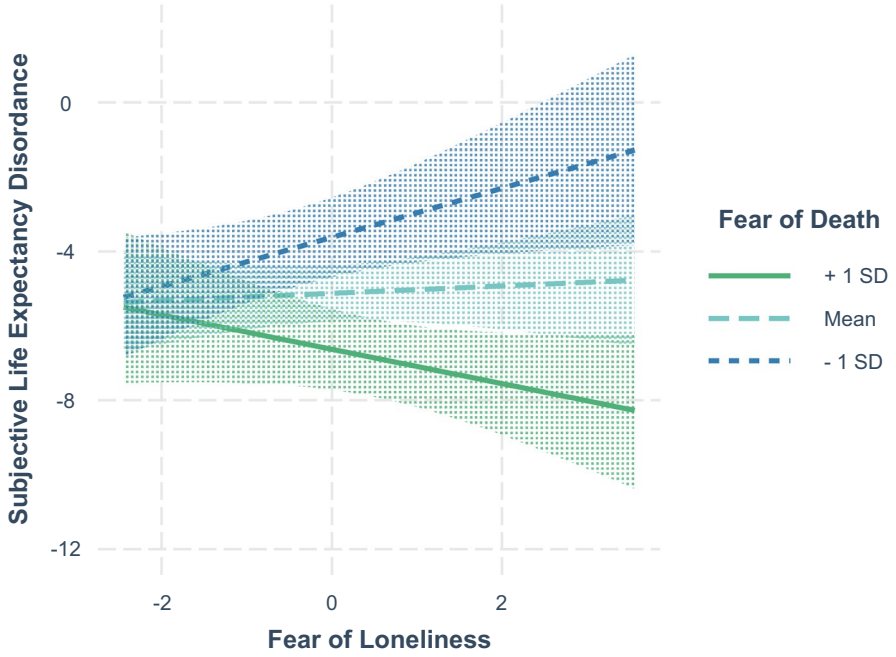

Fig. 3 Interaction of fear of death and fear of loneliness in predicting subjective life expectancy discordance

Notes. Subjective life expectancy discordances are given in years. Values for fear of loneliness in old age are mean-centered.

like to live longer than they expected to—was related to a younger age, being male, and a stronger fear of death. Figure 3 depicts the significant interaction of fear of death and fear of loneliness in their association with SLED: Reporting a weak fear of death but a strong fear of loneliness was related with wanting to live approximately as long as one expected to. Moderate fear of death was related to wanting to live about five years longer than one expected, irrespective of fear of loneliness. A strong fear of death was related to wanting to live longer than one expected, particularly when there was a strong fear of loneliness as well.

General discussion

In both samples, average ideal life expectancies were in the late eighties and interindividual variances were of considerable size. The distributions of ideal life expectancy (lower quartiles at 82 and 85 years of age) indicate that the question whether an individual would or would not like to experience very old age indeed seems to be a relevant one. Consistently across studies, men, participants in better self-rated health, and participants who feared death more strongly wished for longer lives. Study 1 found no direct relation between fear of aging-related diseases and ideal life expectancy. In Study 2, fear of loneliness in old age was related to lower ideal life expectancies only in the bivariate setting. However, interactions between those two fears and the fear of death were significant and indicated that when risks associated with life in very old age were feared but death was not, ideal life expectancies were particularly low. In the following, we will discuss the role and implications of different fears for ideal life expectancy.

A stronger fear of death was related to a higher ideal life expectancy and wishing to live longer than one expected in our analyses. In Study 1, the relation between fear of death and ideal life expectancy was weaker and only marginally significant as soon as the interaction with fear of diseases was entered into the regression. The globally worded item for fear of death used in Study 2 was more consistently related to ideal life expectancy than the time-sensitive item used in Study 1. Nevertheless, there was a tendency in both studies to wish for longer lives when fear of death was high, supporting our hypothesis that wishing for a long(er) life might be one way of avoiding and distancing oneself from the dreaded event of death. Indeed, pushing death into a distant future and denying one's vulnerability is thought of as a proximal defense mechanism against the threat of death (Pyszczynski et al 1999). Wishing for a long life might thus not be solely based on an appreciation of life in very old age, but also on the simple wish not to die any time soon. In contrast, being relatively unafraid of death might make individuals more accepting of scientific and personal expectations regarding longevity.

The relational patterns of fear of loneliness in old age and fear of aging-related diseases were more complex. First,

both fears were significantly and positively related to fear of death, indicating that individuals fearing certain risks of life in very old age, were also more afraid of death. This finding is in accordance with previous research on interrelations between aging anxieties and death anxieties (Benton et al 2007; Bodner et al. 2015). The two fears had no direct relations with ideal life expectancy in the multivariate setting. Instead, their interactions with fear of death reached significance. In all our analyses, ideal life expectancies were lowest when fears regarding potential risks of life in very old age (i.e., loneliness and aging-related diseases) were strong, but fear of death was weak. Hence, individuals fearing what very old age might bring but being unafraid of death were the ones who expressed wishes of dying rather early. This hints at the mindset Lang and Rupprecht (2019) labeled as *medicalist*, that is the valuation of a healthy life over a long life. It also shows that fears regarding the aging process do not automatically result in lower ideal life expectancies, but do so when an earlier death seems like an acceptable resolution.

Another interesting finding pertains to those individuals who had strong fears of both death and risks associated with life in very old age. Those participants were namely the ones wishing for the longest lives and to live clearly longer than they expected. We consider this an indication of *essentialist* mindsets (Lang and Rupprecht 2019; see also Weiss et al 2016), as individuals disregarding both aging and death should be the ones with the strongest desire to overcome them completely and live particularly long or even indefinitely. As already found in previous work (Bowen et al 2020; Lang and Rupprecht 2019), men were more likely to present high ideal life expectancies than women. Reasons for this could lie in women's stronger religiosity, afterlife beliefs, and acceptance of life's finitude (Lifshin et al 2019), but also in differing societal roles and expectations for men and women in (very) old age (e.g., women as givers rather than recipients of care; Arber et al 2008).

Implications and future research

The present research indicates that different fears can be associated with patterns of avoidance when it comes to ideal life expectancy—either wanting to avoid risks of life in very old age or wanting to avoid death. Importantly, particularly strong fears regarding the (future) aging process might even result in death wishes and ideation among older adults (van Wijngaarden et al 2019). One implication that arises is that interventions targeting such fears might help individuals to approach (very) old age in a more positive way and to choose a motivating ideal life expectancy. For this, personal fears could be directly addressed. Although loneliness and the prevalence of aging-related diseases do indeed increase in very old age, they are not inevitable parts of the aging process (Dykstra 2009; White et al 2014). Communicating the aging process as malleable might help to alleviate personal aging-related fears. Additionally, individuals could be encouraged and supported to cope with their fears in more active ways, for example by investing in preparatory behavior (Bowen et al 2019).

In our study, we focused on the implications of fears for ideal life expectancy. Clearly, hopes regarding the aging process could also be of relevance for ideal life expectancies. Adams-Price et al. (2016) identified two distinct, but related subscales for hopes and fears regarding personal longevity. Studies on hoped-for and feared-for future selves have argued that the balance between hopes and fears might be particularly relevant for motivation and goal-setting (Markus and Ruvolo 1989). Future research could thus jointly target hopes and fears regarding the aging process and their associations with ideal life expectancy.

Eventually, another important avenue for future research considers the perception of others who have already lived past the age one personally considers ideal. Would those others be seen as fortunate or unfortunate? Would interactions with individuals of high ages be affected? And how do personal aging-related fears relate to the ways in which older adults are approached?

Limitations

Our work comes with a number of limitations and related opportunities for future research. First off, the effect sizes found were small, particularly in Study 1. One reason for this should be the large interindividual variances in ideal life expectancy. Also, data collection for Study 1 took part during a pandemic, which could mean that fears and their relations to ideal life expectancy were somewhat distorted. Additionally, both samples appear to reflect heterogeneity with regard to household size and migratory background but oversampled women, university-educated individuals, and homeowners (cf. Statistisches Bundesamt 2021). Results may thus not be transferable to individuals living under less privileged conditions. Data analyses were cross-sectional, which limits our findings in two regards. First, the causality behind the relationships we found could not be determined. Second, fears regarding the future (aging process) are variable over time (Smith and Freund 2002) and future research could explore how ideal life expectancies change in accordance with aging-related fears.

Conclusion

In both studies, we observed average ideal life expectancies in the late eighties with crucial interindividual differences. Next to gender and self-rated health, the interplay of fears regarding diseases or loneliness on the one side and fear of death on the other side was able to partly explain

why some individuals prefer shorter lives and others prefer longer lives. Individuals with a strong fear of death wished to live the longest lives, whereas individuals fearing aging-related diseases or loneliness in old age but being unafraid of death wished to live the shortest lives. Helping individuals to actively cope and address their respective aging-related fears might thus allow them to embrace life in old age and wish for a realistic but also motivating length of life.

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Declarations

Conflict interest The authors report no conflict of interest.

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6

General Discussion

General Discussion: Chapter Overview

Summary and Synthesis of Research Findings

The central aim of this dissertation was to get an improved understanding of the so far only scarcely researched construct of ideal life expectancy. In the following, findings from all four research papers (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3; Rupprecht, Martin, & Lang, 2021, Paper #4) will be summarized, synthesized, and integrated into the framework of determinants, processes, and consequences of ideal life expectancy (see Figure 1.1). Second, strengths and limitations of this dissertation will be highlighted and discussed. Third, avenues for future research, which extend what is presently known and understood about the construct of ideal life expectancy, will be presented. In this vein, the original research model depicted in Figure 1.1 will be expanded. Fourth, implications of the present research will be summarized and fifth, a conclusion will be drawn.

To start with the summary and synthesis of the findings, the central research questions asked in the general introduction and in Table 1.2 are briefly addressed and answered in Table 6.1. Based on this summary, the findings will be discussed in greater detail in the following sections.

Findings on Determinants of Ideal Life Expectancies

Contexts, Experiences and Ideal Life Expectancies

First, contexts and individual experiences were investigated as determinants of ideal life expectancy (see first part of Table 6.1). As expected, age, self-rated health, and cultural background did play a role for ideal life expectancies. An older age was related to slightly higher ideal life expectancies (Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3), suggesting an adaptation process as individuals come closer in age to their perceived and ideal life expectancies (also evident in Chopik et al., 2018). Additionally, older adults reported a smaller discrepancy between ideal and perceived life expectancies (Rupprecht & Lang, 2020, Paper #2) and frequently experienced concordance between the two subjective life expectancies (Lang & Rupprecht, Paper #1), suggesting a large acceptance of the anticipated aging process in older ages.

Table 6.1

Summarized Findings regarding the Research Questions Addressed in the Present Dissertation

Area of Research	Research Questions	Summarized Findings
Contexts and Experiences	How is ideal life expectancy related to chronological age?	Higher ideal life expectancies among very old adults; extremely high ideal life expectancies most common among younger men; weaker subjective life expectancy discordances among older adults
	Is self-rated health related to ideal life expectancy?	Consistent relationship between better self-rated health and higher ideal life expectancies; more complex association between self-rated health and subjective life expectancy discordance
	Are there cultural differences in ideal life expectancy (and subjective life expectancy discordance)?	Higher ideal life expectancies and higher subjective life expectancy discordances among participants from the US and Germany as compared to participants from Hong Kong and Taiwan
	How are ideal life expectancies related to experiences as well as shrinking resources during the coronavirus pandemic?	High mean-level and rank-order stability of ideal life expectancies in light of the pandemic; no consistent relations between pandemic-related experiences and ideal life expectancy
Personal Belief Systems and Mindsets	Which main motivational mindsets for longevity and ideal life expectancy can be identified?	Essentialist, medicalist, and stoicist mindsets identifiable in research communities and among single individuals
	Are fear of death and death acceptance related to ideal life expectancies?	Positive relationship between fear of death and ideal life expectancy as well as subjective life expectancy discordance; stronger subjective life expectancy discordances among participants with lower death acceptance; during the pandemic weak influence of ideal life expectancy on fear of death
	Are ideals regarding the anticipated future aging process related to ideals regarding the current aging process? Is subjective life expectancy discordance related to subjective age discordance (= the discrepancy between ideal age and perceived age)?	Significant relationship between subjective life expectancy discordance and subjective age discordance, i.e., wishing to live longer than one anticipates is associated with wishing to be younger than one feels like; stronger subjective life expectancy discordances predict increases in subjective age discordance over time

General Anticipations of Life in Old Age	Are aspects of an individual's future time perspective (i.e., future time opportunity, future time extension, future time constraint) related to ideal life expectancies?	Cross-sectional relations between a higher ideal life expectancy and stronger future time opportunity, stronger future time extension, and weaker future time constraint (before and after controlling for covariates); during the pandemic weak positive influences of ideal life expectancy on future time opportunity and future time extension over time
	Are fears regarding the aging process (i.e., the fear of aging-related diseases and the fear of loneliness in old age) as explicitly negative anticipations of old age associated with lower ideal life expectancies?	Weak association between a stronger fear of loneliness in old age and lower ideal life expectancies; no direct association between fear of aging-related diseases and ideal life expectancy
	Does fear of death moderate the relationship between aging-related fears and ideal life expectancy?	Fear of death moderates the relationship between fear of loneliness in old age and ideal life expectancy and the relationship between fear of aging-related diseases and ideal life expectancy; ideal life expectancies (and subjective life expectancy discordances) were lowest when fear of death was weak but the two other fears were strong
Specific Anticipation of Perceived Life Expectancy	Do individuals distinguish between the life expectancy they perceive for themselves and the life expectancy they wish for themselves? Do most individuals wish to live longer than they anticipate to?	Clear distinction between ideal and perceived life expectancies; mostly in the direction of higher ideal life expectancies; states of concordance (ideal life expectancy = perceived life expectancy) and negative discordance (ideal life expectancy < perceived life expectancy) present as well
	Is subjective life expectancy discordance a meaningful and stable construct?	Subjective life expectancy discordance (just as ideal and perceived life expectancy) is highly stable across intervals ranging from several months to 4 years and exhibits consistent and meaningful relationships to age, gender, self-rated health, psychological well-being, etc.
Consequences	Is the construct of ideal life expectancy related to health behavior change?	Health behavior change as a consequence of the interrelationship between ideal and perceived life expectancies, e.g., increase in health behaviors when ideal life expectancy is low but perceived life expectancy is high
	Is the construct of subjective life expectancy discordance related to psychological well-being?	Cross-sectional association between stronger subjective life expectancy discordance and lower life satisfaction, lower positive affect, and higher negative affect; stronger subjective life expectancy discordances predict increases in negative affect

A better self-rated health was associated with somewhat higher ideal life expectancies (Rupprecht & Lang, Paper #2; Rupprecht, Martin, & Lang, 2021, Paper #4), which is in accordance with prior research (Ambrosi-Randić et al., 2018; Bowen et al., 2020; Bowen & Skirbekk, 2017; Karppinen et al., 2012; Karppinen et al., 2016; Lang et al., 2007; Uotinen et al., 2003). A good self-rated health might hereby positively influence anticipations of old age, and potentially represent a resource for the future aging process of individuals. Relations between self-rated health and subjective life expectancy discordance seem however more complex. Findings from Lang & Rupprecht (2019, Paper #1) suggest that individuals with a better self-rated health might present more moderate discordances, whereas individuals with a worse self-rated health might experience more extreme discordances with either the wish to live much longer or shorter than anticipated.

With regard to culture, subjective life expectancy discordances were compared among participants from the United States, Germany, Taiwan, and Hong Kong (Lang & Rupprecht, 2019, Paper #1). Participants from Taiwan and Hong Kong appeared concordant in their ideal and perceived life expectancies, suggesting a large acceptance of the anticipated aging process, or potentially also a principle of moderation as proposed by Hornsey and colleagues (2018) for holistic regions. In contrast, participants from Germany and the United States more often wished to live longer than they anticipated, particularly when their perceived life expectancy was rather low. This implies that individuals from Western or non-holistic regions might be rather dissatisfied with the anticipation of a rather short life. A similar, although less pronounced and not directly hypothesized pattern could be found for men and women. Overall, men often wished for longer lives than women and presented larger subjective life expectancy discordances (Lang & Rupprecht, 2019; Paper #1, Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3; Rupprecht, Martin, & Lang, 2021, Paper #4). One reason for this could be the stronger religiosity and afterlife beliefs among women, leading to a greater acceptance of the finitude of (mortal) life (Lifshin et al., 2019). Another reason could be the societal roles and expectations for men and women. For example, women are often expected to be the givers but not the recipients of care; accordingly, when asked about attitudes towards life-prolonging medical technologies, women referenced their fear of being a burden to others more often than men (Arber et al., 2008). Women might thus anticipate their life in old age as somewhat incompatible with societal expectations and might be less motivated to experience it.

Overall, lasting contexts associated with individuals' demographics (i.e., culture, gender, and age) as well as rather stable experiences (i.e., self-rated health) were thus consistently associated with ideal life expectancies. In contrast, we found no general associations between experiences in the coronavirus pandemic (i.e., social restrictions, financial restrictions, perceptions of severity and susceptibility to a potential infection) and ideal life expectancies, as well as no overall change in ideal life expectancies across 2018, the first peak of the pandemic in early 2020, and the second peak of the pandemic in late 2020 (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3). This could imply that ideal life expectancies are formed by experiences and knowledge on aging gathered over a lifetime (see research on the formation of views on aging in childhood; Lloyd et al., 2018), rather than by short-term experiences within a single historic episode. The finding of high stability of ideal life expectancies—not only in the context of the pandemic, but also in longitudinal data from before the pandemic (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2)—underlines this assumption. Additionally, comparable contexts and experiences might impact the ideal life expectancies of individuals in distinct ways. Exploratory analyses for Rupprecht, Martin, Kamin, & Lang (2021, Paper #3) not included in the paper indicated that pandemic-related experiences only influenced the ideal life expectancies of younger adults. This could suggest that there might be periods in life in which ideal life expectancies are more malleable and more suggestible to temporary influences.

Personal Belief Systems, Mindsets and Ideal Life Expectancies

Personal belief systems and mindsets build the second class of determinants of ideal life expectancy (see Figure 1.1). Lang & Rupprecht (2019, Paper #1) elaborated on three particular mindsets for longevity motivation, that is, an *essentialist*, a *medicalist*, as well as a *stoicist* mindset. An essentialist mindset reflects the striving for an infinite life, a medicalist mindset the striving for a healthy life, and a stoicist mindset the striving for a dignified life (more thorough explanations can be found in the introduction of this dissertation and in the respective manuscript). First off, demographics, and as such, contexts, and experiences, seemed to influence the mindsets of individuals. Particularly, younger, male, and Western individuals tended to wish for a life much longer than the one they anticipated, indicating a stronger inclination for essentialist mindsets. In contrast, female, older, and non-Western individuals seemed more prone to hold stoicist and medicalist mindsets of longevity motivation.

The three different mindsets also imply differential attitudes and approaches towards death and the finitude of life. Whereas individuals holding an essentialist mindset seem to disregard death and actively distance themselves from it, individuals holding stoicist and particularly, medicalist mindsets should be more accepting and less fearful of death. Low death acceptance and a strong fear of death were indeed associated with the wish to live particularly long, often much longer than one anticipated to (Lang & Rupprecht, 2019, Paper #1; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3; Rupprecht, Martin, & Lang, 2021, Paper #4). This wish for a long life appeared most pronounced for individuals fearing not only their death, but also aspects of their aging process (Rupprecht, Martin, & Lang, 2021, Paper #4). Such individuals might hence construct and wish for alternate realities of growing old. This becomes particularly evident in the association between subjective life expectancy discordance and subjective age discordance (i.e., the discrepancy between ideal age and perceived age; Rupprecht & Lang, 2020, Paper #2): Individuals who wished to live longer than they anticipated to also wished to be younger than they perceived themselves to be. They wished for an alternate aging process and more time in life, both in the present and in the future. They simultaneously wished to live long but to not grow old. In its more moderate forms, an essentialist mindset and the wish for a particularly long life could thus be driven by a strong fear of death. In its extreme forms, an essentialist mindset might however result in the paradox wish to live a long life without ever growing old.

Overall, the associations found between fear of death and ideal life expectancy were in line with predictions of terror management theory (Greenberg et al., 1997; Lifshin et al., 2018; Pyszczynski et al., 1999): The threat of death can result in the disregard and active distancing from death and in the strive for symbolic, but also immediate immortality. Importantly, within the coronavirus pandemic a strong fear of death was however a consequence rather than a determinant of a high ideal life expectancy (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3). Cicirelli (2006) argued that the wish for a long life could exacerbate the fear of death specifically during periods of heightened death awareness. When the age period of mid-old age (cf. Cicirelli, 2006) or events like the coronavirus pandemic bring death to the forefront, the wish for a long life should be particularly threatened and fears of dying and death may increase. Based on these results, it could thus be that fear of death and ideal life expectancy influence each other reicprocally—a claim that will need further investigation.

Whereas the fear of death might thus be associated with a disregard of the finitude of life, patterns of acceptance, such as the acceptance of death, the acceptance of one's perceived life expectancy, as well as the acceptance of one's perceived current aging process were also present within our samples (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #4). Such notions of acceptance—indicative of a stoicist mindset—were somewhat more common among older adults (Lang & Rupprecht, 2019, Paper #1), for whom they should be particularly crucial. When the anticipated aging process is near instead of distant, an accepting stance towards it and a strong belief in one's abilities to cope with upcoming challenges should promote a balanced approach towards aging, an openness to perceive and experience gains next to losses, as well as a generally higher psychological well-being (Rupprecht & Lang, 2020, Paper #2).

Taken together, contexts and experiences seem to shape the ideal life expectancies of individuals—lasting contexts most likely more so than momentary and transitory ones. Additionally, different personal belief systems and mindsets seem to lie behind ideal life expectancies. The research in this dissertation particularly allowed a differentiation and elaboration of stoicist mindsets characterized by the acceptance of aging and death, as well as essentialist mindsets characterized by a disregard and active distancing from aging and death. Future research could focus on a more explicit assessment of personal beliefs and mindsets (e.g., in regard to views on the inevitability of the aging process) and more strongly investigate the role of resources as determinants and moderating influences on ideal life expectancy (e.g., the role of personal mastery).

Findings on Processes behind Ideal Life Expectancies

Anticipations of Old Age and Ideal Life Expectancies

One of the theoretical assumptions of this dissertation is that ideal life expectancies are formed against the background of anticipations of the aging process, and more specifically, perceived life expectancies. Processes of anticipation, evaluation, and contrasting likely take place when individuals decide about their ideal life expectancy: How do I anticipate my life in very old age and is this anticipated life something I desire? How long do I anticipate to live and am I satisfied with this perceived life expectancy, or would I like to live a longer or shorter life? Starting with more general anticipations of old age, prior research has already established associations between more positive

anticipations of the aging process and the wish for a longer life as well as more negative anticipations of the aging process and the wish for a shorter life (Awang et al., 2020; Bowen et al., 2020; Bowen & Skirbekk, 2017). Similarly, in Rupprecht, Martin, Kamin, & Lang (2021, Paper #3), individuals anticipating an extended future filled with opportunities and bare of constraints, were also more likely to present high ideal life expectancies. Anticipations of an open and expansive future (old age) thus appeared to be anticipations of a future worth living. In consequence, maintaining future opportunities and finding means to cope with future constraints could be a way to encourage and strengthen the wish to grow old.

In times of the pandemic, individuals' present and near future were however heavily restricted and particularly among older adults individual future time perspectives decreased (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3). This decrease in future time perspectives did not immediately affect ideal life expectancies, which remained consistently high throughout the pandemic. In constrast, high ideal life expectancies predicted increases in future time extension and opportunity. The association between ideal life expectancy and anticipations of the future aging process may thus not be a simple, linear pathway of anticipation, evaluation, and contrasting. Instead, a circular pathway starting with the formation of ideal life expectancies (through anticipation, evaluation, and contrasting) and followed by feedback loops of renewed anticipation (evaluation, and contrasting) seems plausible. During the pandemic, consistently high ideal life expectancies may for example be able to open up future time perspectives and to positively affect anticipations of the future. In the face of a restricted present and near future, the desire to live a long life may allow individuals to envision and anticipate a more open and expansive distant future.

In regard to more concrete anticipations of the future, there was only a very small relationship between fear of loneliness in old age and lower ideal life expectancies and no general association between fear of aging-related diseases and ideal life expectancies in Rupprecht, Martin, & Lang (2021, Paper #4). Instead, fears regarding life in old age only then resulted in lower ideal life expectancies when fear of death was low. When aging is feared, but death is not, individuals thus seem to have a lower desire for a particularly long life. Those individuals may hence react more drastically to aging-related fears and actively wish for a rather short life and early death in order to avoid the life in old age they fear. Comparable anticipations of old age (e.g., in regard to loneliness and diseases) might

thus have different consequences for different individuals. Next to personal attitudes towards death, the availability of resources to cope with various anticipations of old age could play a crucial role for the resulting ideal life expectancies. For example, individuals with a high sense of mastery or individuals with high social support might be more confident in confronting negative anticipations of life in old age and might have a stronger desire to experience very old age despite the anticipated challenges. Future research could thus take a more differentiated look on the role of anticipations of (very) old age for the ideal life expectancies of single individuals, depending—for example—on the availability of resources.

Ideal Life Expectancies and Perceived Life Expectancies—the Formation of Subjective Life Expectancy Discordances

Even more so than general anticipations of life in old age, the specific anticipation of perceived life expectancy is crucial for the understanding of ideal life expectancies. There seems to be a strong positive correlation between perceived and ideal life expectancies (Rupprecht & Lang, 2020, Paper #2). Participants anticipating longer lives also tended to wish for longer lives, whereas individuals anticipating shorter lives often reported a stronger discordance by wishing to live somewhat longer (Lang & Rupprecht, 2019, Paper #1). Overall, individuals clearly distinguished between perceived and ideal life expectancies and meaningful discrepancies between the two constructs arose, which can be labeled as states of subjective life expectancy discordance and concordance. The following section highlights four different states of discordance and concordance, that is, the wish to live some years longer than anticipated, the wish to live much longer than anticipated, the wish to live as long as anticipated, and the wish to live a shorter life than anticipated.

In Lang & Rupprecht (2019, Paper #1) as well as in Rupprecht & Lang (2020, Paper #2), most participants wished to live longer than anticipated. This is in line with prior research showing that self-related ideals often extend self-perceptions and anticipations (Barnett et al., 2017; Higgins, 1987; Watson et al., 2016) and underlines ideal life expectancy as a form of wishful thinking. In contrast to perceived life expectancies, ideal life expectancies allow and potentially also encourage individuals to contemplate an aging process different from the one they anticipate. Among the group of individuals wishing for longer lives than they anticipate to have, it seems reasonable to distinguish between

individuals wishing for some more years of life (e.g., 1 to 10 years longer) and individuals wishing to live much longer (e.g., more than 10 years longer). The former group experiences discordances that they might theoretically still be able to overcome. For example, regular physical activity and smoking cessation result in an average gain of several more years of life, even when such behaviors are first incorporated in older ages (Taylor et al., 2002; Wen et al., 2011). Additionally, perceived life expectancies are not necessarily accurate and could underestimate actual life expectancies. Individuals with a moderate subjective life expectancy discordance might perceive their ideal life expectancies as feasible desires and might be motivated to bridge the gap between their perceived and ideal life expectancies. Overall, these individuals desire some more years and time in life. This striving for more is assumed to be very common and natural to humans, although it might be more prominent within some cultures, societal groups, and cohorts than others (cf. Hornsey et al., 2018).

In contrast to this, individuals desiring to live much longer than anticipated experience strong discordances. As they consciously state lower perceived life expectancies, they should be well aware of the unlikelihood and unfeasibility of their ideal life expectancies. Such strong discordances could result from a strong fear of death (Rupprech, Martin, & Lang, 2021, Paper #4), the wish to not die any time soon, and an overall disregard of the aging process (cf. essentialist mindset). Another reason for such strong discordances could lie in particularly low perceived life expectancies. Individuals anticipating a short life—for example due to serious illness, socioeconomic deprivation, or other difficult living conditions—might still wish to grow old and have more time in life. The strong discordances they report would then be wishful or even utopian thinking and have the character of longings (cf. Scheibe et al., 2007). Overall, such strong discordances could be associated with despair (see Rupprecht & Lang, 2020, Paper #2) and potentially with less motivation to act and reach what seems unreachable.

Around 30% of the study participants reported a concordance between ideal and perceived life expectancy (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2). They thus gave the same answer to both questions, suggesting that they consider their perceived life expectancy ideal and would not wish for a shorter or longer life. As repeatedly highlighted above, such concordance should in many cases reflect a strong acceptance of the anticipated aging process. The absence of any wishful distancing from one's anticipations might allow an active confrontation with and preparation for the

anticipated aging process and seems to come with positive consequences for the psychological well-being of individuals (see Rupprecht & Lang, 2020, Paper #2). Hypothetically, the state of concordance could however also reflect a form of resignation and discourage individuals from striving towards a longer life. Future research would need to carefully investigate this particular claim.

Lastly, there was an unexpectedly large group of individuals (~ 10%) who wished to live less long than they anticipated to. Individuals in this group seemed to anticipate the last years of their lives in such undesirable or frightening ways that they wished to not experience them. Their fear of growing old might be stronger than their fear of death (Rupprecht, Martin, & Lang, 2021, Paper #4) and individuals might thus prefer the latter over the former. They might see an earlier death and a shorter life as a way to avoid the old age they anticipate in such threatening ways. This finding of negative discordances is a rather troubling one. Whereas general interventions on ideal life expectancy seem premature, interventions explicitly targeting such negative discordances might help individuals to approach their often still distant aging more positively and openly. Interventions in this area could focus on specific fears regarding the aging process (e.g., frailty, loss of autonomy), as well as more general aging anxiety. Such interventions could try to communicate more realistic images of aging. Interventions could also focus on relieving specific fears by giving individuals the means and resources to adequately address them. For example, knowledge about the capabilities of palliative medicine might alleviate individual fears regarding pain and other health issues at the end of life.

Taken together, this dissertation provided additional confirmation that anticipations of one's own old age and future, specifically, future time opportunity, future time extension, future time constraint, fears regarding aging-related diseases, and fears regarding loneliness in old age are related to ideal life expectancies. By wishing for a rather short life, some individuals actively distanced themselves from the threatening aging process they anticipated. Additionally, it was established that perceived and ideal life expectancies forge meaningful discrepancies to each other. Processes of anticipation, evaluation, contrasting, and renewed anticipation thus seem to play a crucial role for ideal life expectancies. In the following, the potential consequences of ideal life expectancies and their discordance or concordance to perceived life expectancies will be highlighted and discussed.

Findings on Consequences of Ideal Life Expectancies

Affective Consequences of Ideal Life Expectancies

The first class of consequences that will be addressed is the one of affective consequences. Self-discrepancy theory (Higgins, 1987) and the theory of life-longings (Scheibe et al., 2007) both predict that strong discordances and unreachable ideals can result in despair, dissatisfaction, and an overall lower psychological well-being. Indeed, a stronger subjective life expectancy discordance was associated with an overall lower psychological well-being and lead to increases in negative affect over time (Rupprecht & Lang, 2020, Paper #2; also see Table 6.1). When the desire to live a long life seems unfeasible, individuals thus tend to report increases in negative affective states, such as feeling afraid or upset. The anticipation of a shorter life than one would wish for means that there is less time in life to gather experiences, to realize one's goals, and to spend time with loved ones than one would like to have. It might also be reflective of an individual's difficulties to accept the anticipated aging process. Next to those negative affective consequences of subjective life expectancy discordances, Scheibe and colleagues (2007) however also suggest that the presence of unreachable ideals and longings comes with the opportunity to imagine and ponder an alternate reality, which may allow an individual to experience positive affective states.

Behavioral Consequences of Ideal Life Expectancies

Another likely class of consequences of ideal life expectancies is the one of behavioral consequences. The association between ideal life expectancies and subjective life expectancy discordances with health behaviors is however a complex one. First, individuals' health behaviors already influence their perceived life expectancies (Griffin et al., 2013) and by doing so likely affect ideal life expectancies and subjective life expectancy discordances. Second, whereas moderate subjective life expectancy discordances might indeed motivate individuals to overcome them by investing in health behaviors, stronger and unbridgeable subjective life expectancy discordances could fail to motivate individuals for behavior change. For example, Bowen and colleagues (2020) found that individuals with particularly low ideal life expectancies presented a higher tobacco use and higher physical inactivity than individuals with ideal life expectancies between 80 and 100 years. Individuals with even higher ideal life expectancies surpassing 100 years did however not invest in even more health behaviors than the group of

individuals wishing for moderate life expectancies. Third, individuals holding a medicalist mindset might prefer comparably low ideal life expectancies but at the same time value health strongly and thus invest in health behaviors. In a preliminary analysis that investigated the interaction between ideal and perceived life expectancy on change in health behaviors (Lang & Rupprecht, 2019, Paper #1), such a complex pattern indeed occurred. Individuals wishing for a short life but anticipating a long one particularly increased their health behaviors over time. This might be indicative of medicalist motivations for a long life. Among individuals anticipating a rather short life, those wishing for longer lives were however the ones adopting a more healthy lifestyle across the scope of four years.

Outlook on Consequences of Ideal Life Expectancies

Apart from the consequences stated above, there should also be other consequences, like the influence of subjective life expectancy discordance on subjective age discordance found in Rupprecht and Lang (2020, Paper #2; see Table 6.1). Specifically, the experience of discordance regarding the anticipated future aging process (= subjective life expectancy discordance) contributed to an experience of discordance within the current aging process (= subjective age discordance) over time. Relatedly, experiences of concordance and acceptance regarding the anticipated future aging process fostered experiences of concordance within the current aging process. Another possible consequence of subjective life expectancy concordance refers to old age planning and preparation. Prior research has shown that perceived life expectancies influence the old age planning and preparation of individuals (Griffin et al., 2012; Kim-Knauss & Lang, 2020; Kornadt et al., 2015). If individuals experience concordance between their perceived and ideal life expectancies, this could strengthen their reliance on perceived life expectancies for an adequate planning for old age. Holding discordant ideals might instead distract individuals from actively considering their perceived life expectancies for the timing of their old-age preparation (cf. Lang & Rupprecht, 2020).

Overall, it seems reasonable to follow the suggestion made by Kornadt and colleagues (2020) that views and approaches towards aging can and should not be interpreted in exclusively positive or exclusively negative ways. Instead, different views and approaches to aging are assumed to be multifunctional and come with costs as well as benefits (Kornadt et al., 2019). In Table 6.2, potential positive as well as negative consequences are depicted for different extents of concordance and discordance between

perceived life expectancies and ideal life expectancies (abbreviated with PLE and ILE). Though some of these consequences are still hypothetical, Table 6.2 highlights that all kinds of discordance and concordance could have costs and benefits for individuals.

Table 6.2

Subjective Life Expectancy Discordances and their Potential Positive and Negative Consequences

	Potential Positive Consequences	**Potential Negative Consequences**
Strong Discordance (PLE << ILE)	Positive emotions through contemplating an alternate reality via wishful thinking; increasing future time perspectives	Despair and dissatisfaction, feelings of incompleteness; low feasibility beliefs regarding ILE; exacerbation of fear of death
Weak Discordance (PLE < ILE)	Strive to overcome discordance; investment in health behaviors	Dissatisfaction (presumably weaker than for strong discordances)
Concordance (PLE = ILE)	Acceptance of the future and current aging process; higher psychological well-being; adequate old-age planning and preparation	Little motivation for behavior change; resignation particularly when PLE is low
Negative Discordance (PLE > ILE)	Health behaviors due to a potentially medicalist mindset	Negative approach towards aging; exacerbation of aging-related fears

Note. PLE = perceived life expectancy, ILE = ideal life expectancy.

Researching the various costs and benefits of certain ideal life expectancies and the related subjective life expectancy discordances thus seems like a worthwhile endeavor for future research. Additionally, it should be considered that the costs and benefits might depend on the age of an individual. As already highlighted, subjective life expectancy concordance might be particularly beneficial for older adults, as the anticipated future aging process is rather near and necessitates an active confrontation. Instead, weak discordances and the wish to live some years longer than anticipated could be most beneficial in middle adulthood when behavior change should be particularly impactful. Lastly, the negative consequences of strong or negative discordances might be somewhat less pronounced for younger adults for whom old age still lies in a very distant future.

Research in this dissertation (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2) was able to establish various consequences of subjective life expectancy discordances, that is, changes in health behavior, an increase in subjective age discordance, as well as an increase in negative affect. Additionally, ideal life expectancies

affected fear of death and future time perspectives during the coronavirus pandemic (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3). Future research should focus on the costs and benefits and the overall ambivalence of ideal life expectancies and subjective life expectancy discordances and concordances. Hereby, costs and benefits and overall consequences could for example depend on the age of an individual.

Strengths and Limitations

In the following, key limitations and strengths of the methodological approach of this dissertation will be listed and briefly discussed.

Operationalization of Study Constructs

The first limitation refers to the assessment of the two constructs ideal and perceived life expectancy. The operationalization of ideal and perceived life expectancy was a parsimonious one and consisted of one item, respectively. Though the high stabilities found across time intervals from eight months to four years (Lang & Rupprecht, 2019, Paper #1; Rupprecht & Lang, 2020, Paper #2; Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3) speak for the single item measures' reliabilities, future research could try to operationalize the constructs using multiple items and indicators. Prior research surrounding anticipations of the length of life has for example asked for subjective probabilities of survival for different ages (Smith, 2001). Ideal life expectancies could for example be assessed across various hypothetical health and aging scenarios (cf. Lawton et al., 2001). Depending on the exact research question, future researchers could decide whether they would opt for simplicity or use a more detailed assessment to operationalize subjective life expectancies.

The second limitation pertains to the fact that answering the questions on perceived and ideal life expectancy was mandatory for participants. Previous research (Ekerdt et al., 2017; Lang et al., 2007; Lawton et al., 1999) has indicated that a non-negligible subset of individuals prefers to not answer questions on their ideal life expectancy and that this choice of not stating an ideal life expectancy may actually be meaningful. For example, individuals avoid thinking about their ideal life expectancies if they believe that the length of their lives is nothing they can influence or need to ponder about, but simply need to accept (Ekerdt et al., 2017; Lang & Rupprecht, 2019, Paper #1; Lawton et al., 1999). Though the mandatory approach allowed to investigate the ideal life

expectancies of all participants and encouraged an active confrontation with the length of one's life, the mandatory answers might be less meaningful for individuals who would have preferred to give no answer.

Sample and Study Design

A core strength of this dissertation is the utilization of lifespan samples and longitudinal data. In prior research, ideal life expectancies were predominantly investigated in samples made up exclusively by younger adults (Bowen et al., 2020) or older adults (Cicirelli, 2006). However, ideal life expectancy is clearly a lifespan construct as it refers to the same ages and period of life for all individuals. Investigating age differences and potential age interactions hence allowed a deeper understanding of the construct of ideal life expectancy. Additionally, prior research on ideal life expectancies has only been cross-sectional. Stability, changes, and causal relationships could thus not be determined. The study designs in this dissertation covered time spans between eight months and four years, and allowed to establish ideal life expectancy and subjective life expectancy discordance as stable constructs and as predictors of negative affect, health behaviors, subjective age discordance, future time perspectives, and fear of death.

There are however also limitations to the samples used. One of them being that the samples were mainly comprised of Western individuals with a relatively high socio-economic status. As research in this dissertation highlighted cultural differences in ideal life expectancies (Lang & Rupprecht, 2019, Paper #1) as well as a relation to the subjective socio-economic status of individuals (Rupprecht, Martin, Kamin, & Lang, Paper #3), future research might try to include more diverse samples. Recently, Awang and colleagues (2020) for example assessed ideal life expectancies in a Malaysian sample and differentiated between Malaysians living in urban and rural regions.

Another limitation pertains to the overall methodological approach as all data were collected via online studies. A multi-method approach including experimental designs or ambulatory assessment would have been desirable. However, due to the coronavirus pandemic this could not be realized. At the same time, the coronavirus pandemic offered the opportunity to investigate ideal life expectancies within a period of major societal change (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3), giving rise to completely new research questions and findings.

Avenues for Future Research

After summarizing and discussing the core findings of this dissertation on ideal life expectancy and the associated construct of subjective life expectancy discordance, the following section will highlight four promising avenues for future research. The first avenue focuses on ideal life expectancy in a social context. Whereas most of the work in this dissertation has focused on ideal life expectancies as individual desires, they are most likely not detached from an individual's social context. Instead, close social relationships as well as broader societal contexts should be of influence. The second avenue focuses on ideal life expectancy and aspects of subjective aging, for example the construct *awareness of age-related change* (Diehl & Wahl, 2010). The third avenue focuses on ideal life expectancy, its potential presence and meaning at the end of life, and its relation to constructs such as will-to-live and wish-to-die (Carmel, 2017; Monforte-Royo et al., 2012). The fourth avenue focuses on potential cognitive consequences of ideal life expectancy, that is, the setting of concrete goals and intentions regarding the aging process and the length of life. Lastly, an expanded research model based on Figure 1.1 will be introduced for further research.

Ideal Life Expectancies in a Social Context

Individuals age within social contexts, collect experiences and knowledge about the aging process within these contexts and may adapt their ideal life expectancies to expectations and values within them. For example, the vicarious aging experiences individuals collect within their immediate social networks should influence their anticipations of the aging process as well as their ideal life expectancies (Brandão et al., 2019; Jopp et al., 2017). Additionally, individuals anticipate their own future and aging not isolated from close others but together with them. In qualitative research on the reasons behind ideal life expectancies (Brandão et al., 2019; Ekerdt et al., 2017; Karppinen et al., 2016), individuals give the anticipated deaths of close others and the wish to not be a burden to their loved ones as reasons against a long life; they state crucial social roles as a parent, grandparent, or spouse as reasons for a long life. Relatedly, the fear of loneliness in old age seemed to play a role for ideal life expectancies in Rupprecht, Martin, & Lang (2021, Paper #4). Investigating the role of immediate social relationships, social support, and social roles, experiences of loneliness, and experiences of bereavement for ideal life expectancy should thus enrich the understanding of its social embeddedness.

Broader, societal contexts should also influence ideal life expectancies. Societal contexts crucially influence the aging process and the actual life expectancies of individuals (GBD 2015 Mortality and Cause of Death Collaborators, 2016). In a cross-cultural study, Bowen and colleagues (2020) found that individuals from Poland gave lower perceived life expectancies and lower ideal life expectancies than individuals from Austria and Norway. As already argued before, societal and cultural contexts should hereby influence individual aging experiences, resources, and anticipations of the aging process. They should however also influence personal beliefs and mindsets as found in Rupprecht & Lang (2020, Paper #1), where individuals from Hong Kong and Taiwan mainly reported concordance between their perceived and ideal life expectancies, whereas individuals from Germany and the United States were wishing for more years in life. For an in-depth understanding of the societal contexts of ideal life expectancies, research in more diverse samples seems indispensable.

Another interesting avenue for future research regarding social contexts might be prescriptive age stereotypes, which describe how older adults are expected to act within their respective societies (cf. North & Fiske, 2013). The common prescriptive age stereotypes of succession and consumption refer to how older adults are expected to limit their usage of resources: They are expected to neither passively consume resources, nor to unnecessarily hold on to resources but to transfer them to younger generations (North & Fiske, 2013). In qualitative studies, notions on these prescriptive age stereotypes become evident as reasons against a long life in individual statements such as “The world does not need the old” and “A retired person who keeps on living is a threat to the national economy” (both quotes from participants of Karppinen et al., 2016, p. 546). The belief that old age burdens society and the partition of resources (such as wealth, influence, and employment) might hence come with the motivation to die rather early. Research may need to look carefully at the potentially detrimental influence of such prescriptive age stereotypes on individual wishes to grow old.

Ideal Life Expectancies and Aspects of Subjective Aging

As individuals age, they experience and become aware of their aging process on a personal and subjective level. In their review, Diehl and colleagues (2014) differentiate between rather unaware and implicit aspects of subjective aging, that is, attitudes towards aging and age stereotypes, as well as more aware and explicit aspects, such as perceived age, self-perceptions of aging, and awareness of age-related change. In regard

to the more implicit subjective aging aspects, this dissertation has already highlighted that views on aging should influence individuals' anticipations of the aging process and the desirability they associate with certain ages. Kornadt and colleagues (2011; 2012; 2017) have hereby convincingly displayed the domain-specificity of views on aging. Targeting this domain-specificity and exploring the overall and individual importance of views of aging in single domains for ideal life expectancy seems promising. For example, individuals holding a more medicalist mindset on aging and longevity would particularly rely on health-related views on aging when forming an ideal life expectancy. Other individuals might evaluate their anticipations in the social domain as more crucial for the age they would like to reach.

On the more explicit side of subjective aging, self-perceptions of aging (e.g., Wurm et al., 2007) and awareness of age-related change (Diehl & Wahl, 2010) might be relevant for ideal life expectancy. If individuals perceive their aging as more negatively and become aware of more age-related losses, their wish to grow older could be weakened. In contrast, positive self-perceptions of aging, as well as a stronger awareness of age-related gains could strengthen the wish to grow old. Particularly when individuals perceive their aging as a unidirectional process, in which losses are irreversible and only predict further losses, negative subjective aging experiences could result in lower ideal life expectancies. If a belief in the multidirectionality, plasticity, and adaptive capacity of aging (Baltes, 1987) could however be strengthened, individuals might look forward to additional years of life despite the aging-related losses they have already experienced.

Ideal Life Expectancies at the End of Life

In this dissertation, ideal life expectancy was mainly regarded as a construct pertaining to the distant personal future. Its meaning and role at the end of life should however also be of crucial interest for future research. When death is tangible, future-related notions on aging and the length of life might lose some of their relevance. Instead, the individual's evaluation of the present moment, and the immediate will-to-live or wish-to-die should gain in relevance for ideal life expectancies.

Whereas seen as normative for healthy younger adults, the will-to-live is not necessarily a given among individuals approaching the end of life (Carmel, 2017). Indeed, the will-to-live tends to weaken in very old age (Carmel, 2001; Chochinov et al., 2005) and is seen as most variable and as most crucial when death is tangible (for will-to-live among

terminally ill individuals see Chochinov et al., 1999; 2005). It should hence be closely associated with ideal life expectancy especially in the final stages of life and under serious psychological distress (e.g., suicidal ideation; Bryan et al., 2016). Factors relevant for the will-to-live of individuals at the end of their lives should also be important for ideal life expectancies in end-of-life contexts. In contrast to younger individuals for whom the anticipation of physical health issues seems particularly crucial for ideal life expectancies (Lang & Rupprecht, 2019, Paper #1), individuals who actually are at the end of their lives focus more strongly on existential, psychological, and social issues than physical health issues when forming their will-to-live (Chochinov et al., 2005).

The wish to die or to hasten death can undermine the will-to-live (Chochinov et al., 2005; Bryan et al., 2016) and is clearly related to ideal life expectancy in qualitative research (Ekerdt et al., 2017). Among terminally ill individuals, occasional wishes to die (faster) are common; concrete and pervasive wishes for death are however less frequent (Albert et al., 2005; Breitbart et al., 2000; Chochinov et al., 1995; Tiernan et al., 2002). Pain and other severe physical symptoms as well as lack of social support play a role for the wish to die (faster) among terminally ill individuals; the most important predictors are however depression and depressive symptoms (Albert et al., 2005; Breitbart et al., 2000; Chochinov et al., 1995; Kelly et al., 2004; Tiernan et al., 2002). Depression, hopelessness, and emotional distress are thus often features of the wish-to-die among terminally ill individuals (also see Monforte-Royo et al., 2012). They are also key to the most extreme consequences of a wish-to-die, that is, suicidal ideation and suicidal behavior (Arsenault-Lapierre et al., 2004; Franklin et al., 2017; Waern et al., 2003). In early as well as very old age, this association between depression, the wish-to-die, and suicidal behavior remains (Linden & Barnow, 1997; Waern et al., 2003). However, there is some hesitant debate about whether the observed increase in readiness for death, tiredness of life, and the wish-to-die among the oldest-old might be natural and functional as opposed to pathological (Barnow et al., 2004; Barnow & Linden, 1996; Fleming et al., 2016; Linden & Barnow, 1997). In the qualitative study by Ekerdt and colleagues (2017), a non-negligible subgroup of older adult participants presented a readiness for death and no desire for a longer life. It seems unlikely that this finding can be fully explained by psychiatric pathology. Instead, another explanation for the increasing readiness to die and decreasing will-to-live in very old age might be the phenomenon of terminal decline (for an overview see Gerstorf & Ram, 2013). Research has shown that many individuals experience a

substantial decline in health, cognitive functioning, and psychological well-being in the last years of life before their death (Gerstorf et al., 2013; Vogel et al., 2013; Wilson et al., 2003). Such heavy declines could contribute to a tiredness of life and ideal life expectancies close to the current age of very old individuals. Future research could for example focus on the role of terminal decline in health, cognitive functioning, and psychological well-being for ideal life expectancies, but also on terminal decline in the construct of ideal life expectancy itself. Ideal life expectancies should furthermore be linked to the constructs will-to-live and wish-to-die (see Bowen et al., 2020, for a preliminary analysis among younger adults).

Ideal Life Expectancies and Goal-Setting

Next to the affective and behavioral consequences already highlighted, ideal life expectancies might also come with cognitive consequences in the form of goal-setting and intention building. In the framework of this dissertation, ideal life expectancy constitutes a stable desire, which can be in concordance as well as in discordance with anticipations regarding the aging process. Desires are defined as personal motivations for a specific state or in this case, a specific length of life (Perugini & Bagozzi, 2004). Desires do not automatically come with a clear intention to act or a specific plan for behavioral actions that will lead to the realization of the desired states (Achtzinger & Gollwitzer, 2010; Gollwitzer, 1993). In contrast to concrete goals and intentions, desires often refer to a more distant future, are less connected to clear actions, and are also perceived as less performable and feasible (Perugini & Bagozzi, 2004).

Desires are however important antecedents of goal-setting and the formation of concrete, behavioral intentions (Perugini & Bagozzi, 2004). When individuals perceive their desires as both important and feasible, they can be translated into goals and concrete intentions to act (Achtzinger & Gollwitzer, 2010; Gollwitzer, 1993). Future research could hence focus on the subjective importance of ideal life expectancies, on their perceived feasibility, as well as on concrete goal formation regarding the length of one's life, but for example also regarding a healthy old age. Research on the concrete formation of goals regarding the length of life is so far very limited. One example pertains to individuals at the end of their lives who form intentions to survive up to certain events, such as the holiday of Passover, Thanksgiving, Christmas, their birthdays, or the beginning of the 20th century. Whereas some research shows that such intentions could indeed result in

survival up to the respective events (Phillips & King, 1988; Shimizu & Pelham, 2008; Sinard, 2001), other research does not support this claim (Phillips et al., 2010).

As ideal life expectancies are most likely not important *and* feasible for all individuals, the formation of conscious goals and intentions may not be the rule. Instead, the less conscious behavioral consequences of ideal life expectancies should also be of crucial interest. There is research showing that wishful thinking alone already comes with "implicit pull effects" (Oettingen et al., 2001, p. 745) towards the desired state. Similarly, desires seen as unfeasible and unattainable could nevertheless give the individual a general sense of direction and guide and elicit behavior towards the idealized state (see theory on life-longings; Scheibe et al., 2007). For example, Popham and colleagues (2011) suggest that the sole desire for a long life might discourage individuals to engage in risk behaviors regarding sex or drug consumption. Slightly manipulating individuals' desires for a long life (cf. Levy et al., 2000; Marques et al., 2014) could hereby allow researching individuals' behavioral tendencies and intentions associated with ideal life expectancies.

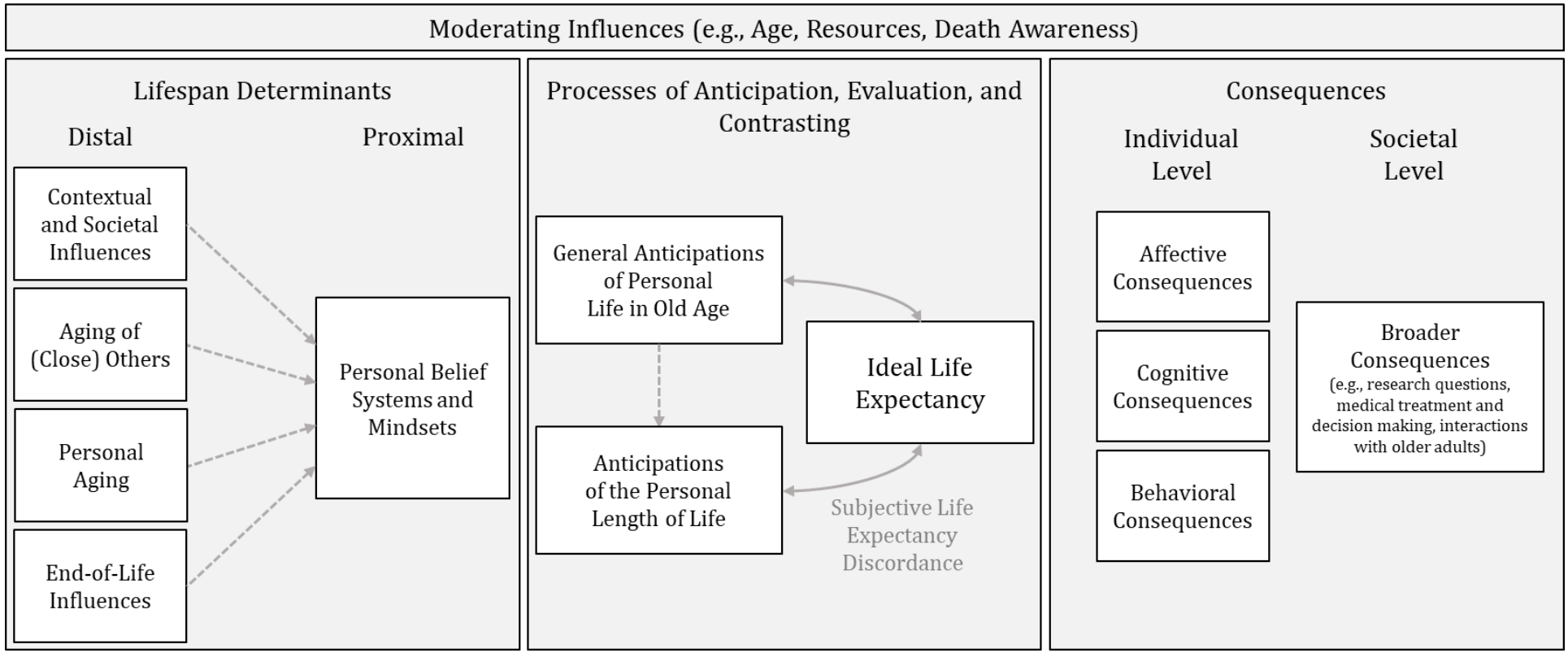
Expanded Research Model

With the initial research model in Figure 1.1 as a starting point, Figure 6.1 depicts an expanded model for future research surrounding the construct of ideal life expectancy. Particularly, the model offers a more differentiated approach to determinants and consequences of ideal life expectancy. The model first defines a number of distal lifespan determinants of ideal life expectancy. *Contextual and Societal Influences* combine long-term influences like the one of culture, gender, or socioeconomic background and rather short-term influences like the one of the coronavirus pandemic, which should influence an individual's ideal life expectancy from early on in their development. Other potentially relevant contexts pertain to technology, care, as well as physical surroundings (Wahl & Gerstorf, 2018). These contexts could for example decide about whether aging in place is likely or even possible—an anticipation that might relate to the desire to experience very old age.

Aging of (Close) Others combines aspects such witnessing the aging process of (close) others, collecting vicarious aging experiences through them, as well as aging together with them. As already highlighted in the section *Ideal Life Expectancies in a Social Context*, these aspects should influence individual outlooks on the future aging process and ideal life expectancies. The aging of (close) others should be important throughout

Figure 6.1

Illustration of an Expanded Research Model



life, but particularly when personal aging experiences are still scarce. These personal aging experiences instead factor into the class of determinants labeled as *Personal and Subjective Aging* (Figure 6.1), which combines implicit and explicit aspects of awareness of the own aging process (see section *Ideal Life Expectancy and Subjective Aging*).

Lastly, *End-of-Life Influences* (Figure 6.1) target the meaning of ideal life expectancy when death is tangible, whether it is one's own death or the death of close others. Experiences of the finitude of life should hereby add to the shaping of ideal life expectancies (also see section *Ideal Life Expectancies at the End of Life*). The ordering of the four classes of determinants implies a temporal sequence of their presence throughout life. Specifically, contextual influences should already be present in early childhood, whereas vicarious aging experiences, personal aging experiences, and end-of-life experiences are likely collected later on. Despite this initially suggested ordering, all four determinants could become relevant for ideal life expectancies at various points in life. Additionally, all four determinants should influence personal belief systems and mindsets, that is, general views and beliefs on aging, living, and death, as well as essentialist, stoicist, and medicalist mindsets. These *Personal Belief Systems and Mindsets* (Figure 6.1) should serve as proximal determinants for ideal life expectancies.

The processes of anticipation, evaluation, and contrasting that surround the formation of ideal life expectancies are retained from the initial model. Next to the already researched role of more general anticipations of life in old age, this dissertation highlights the benefits of jointly investigating ideal and perceived life expectancies and the resulting subjective life expectancy discordances. The expanded model further highlights that the relations between ideal life expectancy and anticipations of the future aging process may be reciprocal and depict a circular pathway of anticipation, evaluation, contrasting, and renewed anticipation. Figure 6.1 depicts potential consequences of ideal life expectancies in greater detail, and emphasizes individual consequences in the affective domain (e.g., psychological well-being, aging-related fears and fear of death), the cognitive domain (e.g., acceptance of the aging process, motivation for change, goal-setting, and intention-building; also see section on *Ideal Life Expectancies and Goal-Setting)*, and the behavioral domain (e.g., health behavior change, old-age preparation and planning). Additionally, broader consequences on the societal level are suggested. Following Lang & Rupprecht (2019, Paper #1), ideal life expectancies and mindsets surrounding them might stimulate

certain research questions, might influence medical treatment and decision making, but also the overall ways in which old and very old adults are approached by society.

The last addition to the research model is the one of *Potential Moderating Influences*, for which age, resources, and death awareness serve as examples. As highlighted before, depending on the age of an individual, determinants could be interpreted and affect ideal life expectancies differentially (see for example research on the subliminal priming of age stereotypes and its age-specific impact on will-to-live; Levy et al., 2000; Marques et al., 2014). Additionally, the consequences of ideal life expectancies and subjective life expectancy discordances could depend on the age of an individual. Resources on the other hand could also influence whether and how certain determinants and anticipations result in higher or lower ideal life expectancies. For example, the impact of negative and threatening experiences associated with the end of life could be dampened by the presence of socioeconomic, psychological, and social resources. Similarly, resources might influence the consequences in which certain ideal life expectancies result. For example, financial assets, self-efficacy, and social support could facilitate positive health behavior change as a consequence of ideal life expectancies. Lastly and as argued by Cicirelli (2006), periods of heightened death awareness could amplify the consequences of ideal life expectancies.

Taken together, this expanded research model for the construct of ideal life expectancy and the presented avenues offer various opportunities for future research. The focus of future research could hereby lie on an overall approach to ideal life expectancy, as well as on specific aspects, like its determinants, the processes surrounding its formation, its consequences, as well as its moderating influences. In the following, the broader implications of this dissertation for research and practice are highlighted.

Implications

Implications for Research

The main implication of this dissertation is that the construct of ideal life expectancy and the related construct of subjective life expectancy discordance are worth to be further investigated. Both represent stable, reliable, and meaningful constructs, which can be of consequence for the development of an individual. As such, they could contribute to the literature and research on subjective aging and views on aging. Namely,

this dissertation elaborated on how an individual's ideal life expectancy and subjective life expectancy discordance can inform about individual mindsets and beliefs regarding aging and death. The current operationalization of ideal life expectancy is a parsimonious way to assess longevity motivation and might also implicitly assess broader attitudes and mindsets regarding the aging process. Additionally and as highlighted in Rupprecht & Lang (2020, Paper #2), research on aging ideals in general could enrich (subjective) aging research. Self-related aging ideals should on the one hand influence how individuals evaluate and perceive their aging process, that is, whether they age in the ways they would consider ideal. On the other hand, aging ideals might guide an individual and come with affective, cognitive, and behavioral consequences. Hereby, it seems particularly important to investigate the ambivalence, costs, and benefits of high and low ideals (cf. Kornadt et al., 2020).

Existing theoretical models like the theory of life-longings (Scheibe et al., 2007) and self-discrepancy theory (Higgins, 1987) can be transferred to ideals regarding the aging process. This dissertational work can however also be seen as a starting point for theoretical models explicit for the construct of ideal life expectancy and more general aging-related ideals. The lifespan determinants suggested in Figure 6.1 likely serve as determinants not only for ideal life expectancy but also for other aging ideals. Processes of anticipation, evaluation, and contrasting should be particularly relevant for future-related aging ideals. For ideals regarding the current aging process (e.g., the age an individual would currently wish to be), processes of anticipation could be replaced by processes of perception (i.e., self-perceptions of aging). Lastly, consequences of aging ideals seem likely, particularly when these aging ideals are interpreted and contrasted with aging anticipations and self-perceptions.

The three mindsets for longevity motivation identified by Lang and Rupprecht (2019, Paper #1) have implications beyond ideal life expectancies. They reflect approaches not only towards longevity, but towards the aging process in general. They may not only be present among single individuals, but can influence research areas as well as public decision-making. As such, an in-depth understanding and investigation of these broader mindsets seems a promising endeavor for future research. Importantly, the three mindsets are not exclusive but could be suspect to (societal) change and should be complemented by further research.

Practical Implications

The first practical implication of this dissertation is that most individuals actually wish for a long life—often a life longer than the one they anticipate. This suggests rather positive attitudes towards growing old among most individuals, a finding that could be utilized to further encourage positive views on the aging process. The common strive for a long life could also be actively used to encourage individuals to engage in health behaviors and to avoid risk behaviors. Additionally, this dissertation showed that individuals are able and mostly open to reflect on their ideal life expectancies, an encouraging finding when it comes to the beneficial aspects of confronting and preparing for the end of one's life.

A second practical implication of this dissertation refers to psychopathology and psychotherapy. Death anxiety and difficulties to accept the finitude of life are common problems present across the whole spectrum of psychopathology (Iverach et al., 2014). Discrepancies between self-perceptions and ideals are seen as robust contributors to psychopathology as well (Mason et al., 2019). This dissertation shows that strong subjective life expectancy discordances combine several of these aspects of psychopathology: They reflect a difficulty to accept one's perceived life expectancy (Lang & Rupprecht, 2019, Paper #1), they are indicative and predictive of a strong fear of death (Rupprecht, Martin, Kamin, & Lang, 2021, Paper #3; Rupprecht, Martin, & Lang, 2021, Paper #4), they reflect the presence of unfeasible and discouraging ideals (Rupprecht & Lang, 2020, Paper #2), and they are predictors of increases in negative emotionality (Rupprecht & Lang, 2020, Paper #2). As such, strong subjective life expectancy discordances might be present and of concern in clinical samples and might be worth to be addressed and targeted. Future research could investigate subjective life expectancy discordances specifically in clinical samples.

A third practical implication pertains to the topic of ageism and the discrimination of older adults. Namely, aging ideals and ideal life expectancies may not only serve as a standard against which one's own aging process is evaluated, but also the aging process of others. For example, individuals striving to reach the age of 100 years might perceive centenarians in a much more positive light than individuals who see the age of 100 years as undesirable or threatening for themselves. On the other hand, individuals might subconsciously try to uphold and validate their aging ideals. When confronted with older adults who do not meet one's personal aging ideals (e.g., regarding a healthy old age),

individuals might distance themselves from those older adults and fail to identify with them. In extreme cases, ideal life expectancies could thus result in the devaluation of certain groups of older adults. Again, future research should first carefully evaluate these suggested implications of ideal life expectancies.

Conclusion

Ideal life expectancy is a notion on ideal and sometimes even utopian development. Findings in this dissertation support the assumption that most humans would consider a long life ideal and that many strive to live longer than they can personally and scientifically expect. Negative views on aging, negative anticipations of old age, as well as a lack of resources can however dampen individual ideal life expectancies considerably. In light of the demographic change and increasing individual prospects to reach a very old age, high ideal life expectancies seem beneficial and a positive approach towards a long life should be fostered. At the same time, a stoicist acceptance of the aging process and the finitude of life should positively contribute to an individual's overall psychological well-being. It might thus be a delicate balance to encourage individuals to strive for more years in life while at the same time fostering acceptance of the limitations of aging and the human life.

Despite pertaining to a seemingly distant, abstract, and unknown future, ideal life expectancies come with various affective, behavioral, and cognitive consequences. This finding underlines that adults of all ages are aware of the temporal limitations of human life and can be motivated as well as discouraged by the desire for more time and more years of life. The finitude and fragility of life as well as ideals and perceptions associated with it are thus not only of relevance for individuals who are close to death, but should be of relevance for human life in general. Research on ideals, wishes, and hopes regarding life's finiteness should thus find its way into the psychological research of the aging process. This dissertation attempted to be a starting point for this endeavor and has herefore provided outlooks and opportunities for future research as well as central implications.

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List of Abbreviations

CFT	Comparative fit index
COVID-19	Coronavirus disease 2019
ESEM	Exploratory structural equation modeling
FTC	Future time constraint
FTE	Future time extension
FTO	Future time opportunity
ILE	Ideal life expectancy
ISCED	International standard classification of education
PLE	Perceived life expectancy
RMSEA	Root-mean-square error of approximation
SAD	Subjective age discordance
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
SLED	Subjective life expectancy discordance
TLI	Tucker-Lewis Index