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The Influence of Critical Life Events on Life Trajectories – An Investigation of Personality Development, Well-Being, and Core Beliefs

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TREE OF LIFE PATH – Daniel Tousignant

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List of Abbreviations

CFI – comparative fit index

CI – confidence interval

COVID-19 – coronavirus disease 2019

Df – degrees of freedom

DMI – dweck's mindset instrument

FFM – five factor model

FIML – full-information maximum-likelihood method

GePP – german personality panel

GFI – goodness of fit index

GSE – general self-efficacy scale

M – mean

OCEAN – openness, consciousness, extraversion, agreeableness, neuroticism

RMSEA – root mean square error of approximation

SD – standard deviation

SEM – structural equation model

SIT – social investment theory

SPT – set point theory

SRMR – standardized root mean square residual

SWLS – satisfaction with life scale

TAKE5 – big five personality inventory for work context

TLI – tucker-lewis index

WEIRD – western, educated, industrialized, rich and democratic societies

WHO – world health organization

Summary

Much has been achieved with regard to how critical life events influence trajectories in life. Theories on the development of personality and well-being emphasize that people differ in the rate, timing, and direction life events influence certain personality traits and key indicators of well-being such as life satisfaction. However, there has been an urgent call for longitudinal studies exploring processes that underlie individual differences of the appraisal and reaction to critical life events. This dissertation seeks to meet this plea by investigating the influence of specific and non-specific critical life events on personality development and life satisfaction, taking into account one's subjective perception of these events. Since core beliefs can alter mental representations of life events, the present dissertation explores a possible moderating role of mindset and self-efficacy. Moreover, this dissertation places particular focus on the assessment of life events and implications for the critical age periods of adolescence and emerging adulthood. While the first longitudinal study (N = 1,243) focusses on the influence of two specific life events, school graduation and moving away from the childhood home, on trait changes in the Big Five, the second study (N = 1,477) explores personality development below the domain level in trait intellect, a facet of openness, with regard to predominantly non-specific life events. The third study (N = 1,920) expands the scope of the current thesis by considering the impact of a collective experienced life event, the COVID-19 pandemic, on the development of life satisfaction over four measurement occasions. Across the three studies, I investigate individual differences by considering the moderating role of the core beliefs of mindset or self-efficacy. Although none of the studies suggest that these critical life events have an influence in and of themselves, results reveal significant personality changes (Study 1) and changes in life satisfaction (Study 3) when taking into account subjective perceptions of the critical life events. Further, the results of studies 1 and 2 indicate personality development in traits that are associated with mature functioning. While a moderating role of mindset was found in study 1 regarding the influence of the perception of the life event *graduation* on levels in extraversion and neuroticism, results indicated no moderating effects of self-efficacy in

the studies 2 and 3. However, the present results reveal selection and socialization effects of self-efficacy with respect to the development of intellect (Study 2), and significant effects of self-efficacy on life satisfaction before and during the COVID-19 pandemic (Study 3). All in all, the present findings contribute to a deeper understanding on the processing of life events, but further longitudinal studies are needed to observe individual life trajectories in young adulthood with respect to different event characteristics and implicit beliefs. In the conclusion, limitations of this dissertation, future research ideas, as well as practical implications for adolescents and emerging adults are discussed.

Zusammenfassung

Die Forschung rund um den Einfluss von Lebensereignissen erzielte in den letzten Jahrzehnten einen deutlichen Erkenntniszuwachs. Übereinstimmung herrscht bei Theorien zur Entwicklung der Persönlichkeit und des subjektiven Wohlbefindens in Bezug darauf, dass sich der Einfluss von kritischen Lebensereignissen in seinem Ausmaß, dem zeitlichen Rahmen und der Wirkung von Mensch zu Mensch unterscheidet. Kürzlich ist jedoch ein Appell nach mehr Längsschnittstudien lauter geworden, welche individuelle Unterschiede bei der Bewertung und Reaktion auf kritische Lebensereignisse berücksichtigen. Die vorliegende Dissertation hat das Ziel, diesem Ruf nachzugehen, indem sie den Einfluss spezifischer und unspezifischer kritischer Lebensereignisse auf die Persönlichkeitsentwicklung und Lebenszufriedenheit unter Berücksichtigung der subjektiven Wahrnehmung dieser Ereignisse untersucht. Da die Wirkung von Lebensereignissen durch Glaubenssätze, bzw. deren mentale Repräsentationen, beeinflusst werden kann, untersucht die vorliegende Dissertation mögliche Moderationseffekte anhand des Mindsets und der Selbstwirksamkeit. Darüber hinaus wird ein besonderer Fokus auf die subjektive Bewertung von Lebensereignissen gelegt und Implikationen für die kritischen Altersphasen zwischen der Adoleszenz und dem jungen Erwachsenenalter untersucht. Während sich die erste Studie (N = 1,243) auf den Einfluss zweier spezifischer Lebensereignisse, dem Schulabschluss und dem Auszug von zu Hause, und der Entwicklung der Big Five konzentriert, untersucht die zweite Studie (N = 1,477) die Persönlichkeitsentwicklung in dem Merkmal Intellekt, einer Facette von Offenheit, hauptsächlich in Bezug auf unspezifische Lebensereignisse. Die dritte Studie (N = 1,920) erweitert den Rahmen der vorliegenden Dissertation, indem sie den Einfluss eines kollektiv erlebten kritischen Lebensereignisses, der COVID-19-Pandemie, auf die Entwicklung der Lebenszufriedenheit über vier Messzeitpunkte hinweg betrachtet. In allen drei Studien werden individuelle Unterschiede in Form von Glaubenssätzen berücksichtigt, indem in der ersten Studie Moderationseffekte von Mindset, und in den Studien 2 und 3 Moderationseffekte von Selbstwirksamkeit untersucht werden. Die Ergebnisse aller

drei Studien verdeutlichen, dass kein Einfluss der spezifischen oder unspezifischen Lebensereignisse nachgewiesen werden konnte, wenn das reine Erleben des Ereignisses erfasst wurde. Wenn jedoch die subjektive Wahrnehmung berücksichtigt wurde, konnten signifikante Persönlichkeitsveränderungen (Studie 1) und eine Veränderung der Lebenszufriedenheit (Studie 3) festgestellt werden. Darüber hinaus verdeutlichen die Ergebnisse von Studie 1 und 2 eine Veränderung in denjenigen Persönlichkeitsmerkmalen, die auf einen Reifungsprozess im jungen Erwachsenenalter hindeuten. In Bezug auf den Einfluss von Glaubenssätzen, moderierte Mindset in Studie 1 den Einfluss von der Wahrnehmung des Lebensereignisses *Schulabschluss* auf die Ausprägung in Extraversion und Neurotizismus. Für Selbstwirksamkeit zeigten sich in den Studien 2 und 3 hingegen keine moderierenden Effekte. Dennoch konnten Selektions– und Sozialisationseffekte von Selbstwirksamkeit im Hinblick auf die Entwicklung von Intellekt (Studie 2) bestätigt werden. Des Weiteren wurden signifikante Auswirkungen der Selbstwirksamkeit auf die Lebenszufriedenheit vor und während der COVID-19-Pandemie (Studie 3) nachgewiesen. Zusammenfassend tragen die vorliegenden Ergebnisse zu einem tieferen Verständnis über die Reaktion und Verarbeitung von Lebensereignissen bei. Dennoch sind weitere Längsschnittstudien erforderlich, um individuelle Lebensverläufe in Bezug auf Glaubenssätze nachzuvollziehen und den Einfluss von Lebensereignis–Charakteristika über das subjektive Erleben hinaus zu analysieren. Abschließend werden Grenzen dieser Dissertation, zukünftige Forschungsideen, sowie praktische Implikationen für die Entwicklung im jungen Erwachsenenalter diskutiert.

Chapter 1

Introduction

Introduction

People say, there is no such thing as a straight path in life. Ergo, life as we know it has its inevitable ups and downs. At the same time, we strive to achieve milestones and follow orderly tracks that will hopefully push us in the direction of the life we want to live. This stems from a deep desire for personal growth and individual happiness that has been a key concern for individuals and societies across the ages – already discussed as the ultimate goal in human existence from Aristotle in his Nicomachean Ethics 2,300 years ago until this day (Diener et al., 1998; Linley et al., 2009). However, life truly is a journey, and we are often confronted with challenges and adversity. Eventually, something unexpected happens – something we did not see coming, or something we planned have for but which wipes us off our feet nonetheless. We realize our life has been turned upside-down and great changes are approaching. This could be a shift in our lives that requires major adjustments to our direct personal environment, status or even the self.

These situations are often labeled *critical life events*. Such decisive events mark the beginning of something new – a shift that will most likely be seen as a turning point in our life. More specifically, research has defined critical life events as "transitions that mark the beginning or the end of a specific status" (Luhmann et al., 2012, p. 594). They are characterized as occurring at a clear point in time as well as being personally significant, and thus memorable for those who experienced them (Luhmann et al., 2020). Across the entire lifespan, we encounter a large number of critical life events, which are often associated with individual milestones (Wilt et al., 2016). These include, for example, obtaining a driver's license and buying one's first car, graduating from school, moving out of one's childhood home, getting divorced, becoming a parent, losing a job, or experiencing the recent COVID-19 pandemic (e.g., Bleidorn et al., 2018; Denissen, et al., 2019; Wilt et al., 2016). The latter experience can be most appropriately described as a *collective* experienced critical life event, since the COVID-19 pandemic and related measures affected many if not most people around the world (Wundrack et al., 2021).

As shown by the great variety of critical life events, they encompass negative as well as positive experiences (e.g., Mangelsdorf et al., 2019). For example, the break-up of a romantic relationship can be experienced as a relief on the one hand and as devastating on the other. Thus, the same life event can be subjectively perceived quite differently (Haehner et al., 2021; Luhmann et al., 2020). The assessment of critical life events, which has changed a lot in recent years, reflects this distinction. Whereas life events used to be assessed based on their mere occurrence (e.g., Headey & Wearing, 1989; Kendler et al., 2003; Loeckenhoff et al., 2009), research has now moved on to emphasize a dimensional approach to life events. This can be achieved by assessing life events on a dimensional continuum that captures negative as well as positive perceptions of life events (e.g., Bleidorn et al., 2020; De Vries et al., 2021; Fassbender et al., 2021; Haehner et al., 2021; Luhmann et al., 2020). This reasoning reflects not only that critical life events interact with individuals' preexisting characteristics and attitudes, but also that one's perception of an event has a greater influence on potential consequences compared to the occurrence of the life event alone.

But what really happens when we experience such a critical life event? This question is of great relevance due to its direct implications for our (daily) lives. Many attempts have been made to understand when and why our lives depart from their previous "straight path" and move in a different direction. On the one hand, we are interested in the determinants of our reaction to critical life events and on the other hand, what the implications of life events are for our individual development.

From a personality perspective, research has demonstrated not only that certain life events can sustainably affect personality traits, but also that specific events are processed differently depending on existing personality characteristics, with some events being more likely to be experienced than others (Bleidorn et al., 2018; Jackson et al., 2012). The underlying assumption here is that personality is modifiable and thus can change in response to both environmental and internal influences (Geukes et al., 2018; Goldberg, 1992; McCrae & Costa, 2008; Roberts & Mroczek, 2008). For example, specific personality traits from the Five Factor Model (Digman, 1990; Goldberg, 1990) have been repeatedly

linked to how certain life events are experienced (e.g., Bleidorn, 2012; Luedtke et al., 2011; Specht et al., 2011), whereas life events alter the expression of these traits (Jackson et al., 2012; Kandler et al., 2012; Neyer et al., 2014).

Furthermore, life events can affect broader constructs such as our overall well-being (Fujita & Diener, 2005; Lucas et al., 2004; Luhmann et al., 2012; Yap & Baharudin, 2016). Referring to the beginning of this introduction, most people strive for a fulfilling and satisfactory life to live in (e.g., Diener et al., 1998; Linley et al., 2009). However, sometimes critical life events interfere with our desires, needs, and emotions, and unsettle our feelings about future directions and options. In this context, life events might be so impactful that we never return to our former levels of life satisfaction and permanently leave our intended path in life. However, the debate on how far-reaching the implications of life events might be regarding life satisfaction is still ongoing (Diener et al., 2006; Headey & Muffels, 2018; Ormel et al., 2017).

Now that we have a sense of how critical life events can alter our personality and well-being, another pressing question arises. Looking right, we see, with great surprise, our neighbor dealing with the death of their spouse just fine, and looking left, we see, in disbelief, our best friend not enjoying life any more after retiring. At the same time, we remember being terrified of moving out of our childhood home, even though we had planned for it to happen. Thus, we ask ourselves: why can we not relate to the actions and *re*actions of the people around us to the exact same critical life events?

Several attempts have been made to explain individual differences regarding critical life events. A promising explanation derives from our deepest core beliefs. According to Dweck (2017), core beliefs represent mental representations that individuals hold about themselves, others, and the world in general. Thus, core beliefs are strongly related to subjective appraisals and might be a valuable source for determining how we approach and deal with life events. One individual framework of core beliefs is known as *mindset*. Mindset refers to one's implicit beliefs about the malleability of personal attributes (Dweck, 1999). Dweck (1999) distinguishes between a growth mindset, which refers to the

belief that attributes like intelligence or personality are changeable, and a fixed mindset, which refers to the belief that such attributes are immutable. With respect to life events, nascent research empathizes that mindset serves as a predictor of resilience to challenges, suggesting that a growth mindset acts as a buffer in the face of adversely experienced critical life events (e.g., Burnette et al., 2018; Dweck, 2012; Schroder et al., 2017).

This association was also previously found for the core belief of *self-efficacy*, which describes a person's expectation that they will be able to successfully perform desired actions based on their own competencies and sustain or regulate cognitive, motivational, and affective processes (Bandura, 1997). Like mindset, self-efficacy beliefs have been shown to promote subjective well-being as well as health aspects across different samples and cultures (Bandura 1997; Benight & Bandura, 2004; Luszczynska et al., 2005). Thus, even though self-efficacy addresses a rather active engagement in terms of controllability appraisals, both mindset and self-efficacy might explain how critical life events are integrated into our lives and determine how we approach and deal with them individually.

As a matter of fact, several theories have been developed with the aim of disentangling different parts of the picture. There are theories about personality development (Five-Factor Theory, McCrae & Costa, 2008; Cybernetic Big Five Theory, DeYoung, 2015), person–environment interactions (Disposition–Adaptation–Environment Model, Asendorpf & Motti-Stefanidi, 2018; [revised] Sociogenomic Model, Roberts, 2018), that specifically focus on age (Maturity Principle, Roberts & Mroczek, 2008), and external influences (TESSERA framework, Wrzus & Roberts, 2017; Social Investment Theory, Roberts & Wood, 2006), and about how life events influence the trajectory of our well-being and life satisfaction (Set-Point-Theory, Headey & Wearing, 1989). However, there has not yet been a comprehensive investigation linking these objectives, and we have only scratched the tip of the iceberg with regard to a connection to implicit beliefs. Hence, we still know very little about how to integrate malleability beliefs and controllability appraisals into these theories, and an exhaustive empirical analysis of the underlying processes is still lacking.

The current dissertation aims at closing this gap by investigating associations between environmental influences of critical life events, the subjective appraisal of life events, possible related developments in personality and how our well-being is influenced (permanently). Further, the purpose of this dissertation is to contribute to a deeper understanding of the underlying processes. Thus, the core beliefs mindset and self-efficacy are highlighted in order to model individual differences in the processing of critical life events. Longitudinal developments are discussed regarding a vulnerable age period: from adolescence to emerging adulthood. This life stage is a demographically and subjectively distinct period that reaches from the teens through the twenties and is characterized by fluctuating personality development and mutually shared developmental tasks (Arnett, 2000; Bleidorn, 2015; Luedtke et al., 2011; Roberts et al., 2006). Henceforth this period is summarized in the present dissertation with the term of *young adulthood.*

Following this brief introduction, I first present the rationale for critical life events with respect to personality development and change. In order to explore personality trait change on a fine-grained level, personality development is investigated not only on the domain, but also on the facet level. This chapter also highlights the importance of examining subjective appraisals to life events and forging links between specific life events and related changes in subjective well-being. I outline the theoretical foundation for core beliefs and why they represent a key variable when exploring individual differences.

Life Events and Personality Change

Personality is Malleable

The Big Five (Goldberg, 1990) and the Five Factor Model (Costa & McCrae, 1995) are accepted as frameworks for describing interindividual differences in personality. The frameworks refer to the five broad personality domains called openness, conscientiousness, extraversion, agreeableness, and neuroticism, which are examined in the current dissertation to investigate stability and changes in personality. Here, personality traits are referred to as “enduring patterns of thoughts, feelings, and

actions" (McCrae & Costa, 2008, p. 160). Theory and research indicate that personality traits change throughout the life span (Costa et al., 2019; Roberts et al., 2006; Roberts & DelVecchio, 2000), whereby Bleidorn et al. (2021) described the progression of personality research quite accurately as evolving "from plaster to Play-Doh": we have moved away from the assumption that traits are highly stable entities and that personality development is completed by age 30 (McCrae et al., 2000), to a consensus that personality changes persistently across the life span (Ardelt, 2000; Costa et al., 2019; Roberts et al., 2006; Roberts & DelVecchio, 2000).

Young Adulthood. Nonetheless, there are certain periods in life where personality change tends to be greater than in others. For example, the period between adolescence and emerging adulthood constitutes a period of great change, which is characterized by identity formation and self-awareness, exploration, and autonomy gains (Arnett, 2000, 2007; Costa et al., 2019; Specht et al., 2014). During young adulthood, personality traits undergo particularly substantial mean-level changes (Roberts et al., 2006) and differences in individual trait changes appear to be most pronounced (Schwaba & Bleidorn, 2018). During this time, average conscientiousness, agreeableness, and openness increase, whereas neuroticism decreases (Arnett, 2000; Bleidorn, 2015; Bleidorn & Schwaba, 2017; Roberts, et al., 2006). This pattern is best summarized by the maturity principle, which refers to an increase in traits that are most relevant for greater maturity, and which is generalizable across cohorts and genders (Bleidorn et al., 2021; Roberts et al., 2006). These fluctuations emphasize the need to consider young adulthood as a vulnerable, yet critical life stage that provides rich ground for exploring personality development (Bleidorn et al., 2020; Luedtke et al., 2011).

Life Events Influence Personality

Theories of personality development consistently emphasize that personality change occurs as a result of intrinsic factors such as genetics as well as extrinsic factors like our surroundings (Bleidorn & Schwaba, 2017; Wagner et al., 2020). Consequently, personality change can be linked to certain

external influences such as critical life events, as "life events can modify, interrupt or redirect life trajectories by altering individuals' feelings, thoughts and behaviors" (Bleidorn et al., 2018, p. 83).

Moving Away from Home and Graduation. In the present dissertation, I started to investigate the influence of critical life events on personality development with two decisive life events that are highly characteristic of young adulthood. The first one is moving out of one's childhood home, which can be perceived as a bittersweet occasion. For some young adults, this event might constitute a relief, a grasp for freedom and independence. For others, this life event might be associated with distress and fear that one will not be able to survive outside the comfort of one's previous home (Pusch et al., 2018; Bleidorn et al., 2018; Sørensen & Nielsen, 2021).

The second event is school graduation, which is often the very first significant milestone young adults must achieve (Wilt et al., 2016). Graduation is associated with a great amount of pressure concerning grades, which can affect university entrance, as well as psychological pressure from parents and peers (Arnett, 2000; Wilt et al., 2016). Hence, this event might be decisive for one's individual plans and associated life transitions, whilst perceived success versus failure could determine how further challenges are approached in the future.

Concerning personality change, research on these life events suggests a mixed picture. Pusch et al. (2018) found no differences in personality change for young adults who moved out of their childhood home versus those who did not. However, a different but quite similar event such as the first co-residence with a romantic partner has been associated with increases in agreeableness and decreases in openness (Pusch et al., 2018). For graduation and the transition from school to college or employment, several studies have found significant increases in conscientiousness, agreeableness, and openness, as well as decreases in neuroticism (Leikas & Salmela-Aro, 2015; Luedtke et al., 2009; Luedtke et al., 2011). Similar results were reported by Bleidorn (2012) in a longitudinal sample of German high school seniors. The author found an increase in the same traits and, to a lesser degree, a decrease in neuroticism following graduation (Bleidorn, 2012).

However, there are many more distinct life events and developmental tasks that interfere with the "straight path" in life a person at that age might pursue (e.g, Leikas & Salmela-Aro, 2015; Specht et al., 2014). For example, starting one's first job has been associated with pronounced personality changes, such as increases in agreeableness, conscientiousness, and openness (Luedtke et al., 2011; Specht et al., 2011). Moreover, the personally significant life event of a first romantic relationship has been repeatedly found to be related to increases in emotional stability and extraversion (Neyer & Lehnart, 2007; Wagner et al., 2015). As such, the Study 2 of the present dissertation takes a different, more expansive approach to critical life events by including a range of important events that young adults might perceive as relevant.

Personality Influences the Processing of Life Events

In the same way critical life events can influence personality development trajectories, personality has an impact how we approach life events (Asselmann et al., 2021; Bleidorn et al., 2020). For example, high levels of openness have been shown to influence the processing of life events that have implications for an individual's cognitive patterns and thinking (e.g., Bleidorn et al., 2018). Indeed, this can be shown on the facet level as well. Intellect, a facet of openness (DeYoung et al., 2007; Goldberg, 1992), encompasses attributes such as being smart, clever, and curious (Costa & McCrae, 1995; DeYoung et al., 2012; Goldberg, 1992). People who display high levels of intellect like information-seeking and enjoy tasks related to problem-solving and learning (Mussel, 2013; Litman & Mussel, 2013). Correspondingly, people high in intellect are more likely to enjoy and successfully navigate critical life events that are associated with intellectual engagement. For example, studies have repeatedly shown that high levels of intellect are associated with higher academic performance and achievement (Caprara et al., 2011; Mussel et al., 2011; Von Stumm et al., 2013), as well as professional success (e.g., Campbell et al., 1993). Moreover, most changes in intellect occur when people are exposed to cognitively demanding tasks and exhibit creative thinking and exploratory behavior (Mussel et al., 2011; Mussel & Spengler, 2015; Von Stumm et al., 2011). Thus, especially in young

adulthood, when life events take place that require individuals to master cognitively demanding challenges and apply problem-solving strategies, intellect might influence how events like graduating from school, moving to a new town, or entering working life are processed.

Given that personality is malleable, one can also argue that intellect might further increase during this time. Evidence for this stems from various sources. From the perspective of intervention studies, effective change in trait levels requires people to actively engage in tasks and challenges that pull their behavior in the direction of the desired trait levels (e.g., Hudson et al., 2019). This was previously found for the subordinate domain of openness: when students experienced a novel situation such as studying abroad, a situation that is typically associated with intellectually demanding challenges, their openness levels increased (Zimmerman & Neyer, 2013). Hence, when young adults follow their desire to experience intellectually stimulating life events, their intellect levels are likely to further increase.

Life Events and Well-Being

So far, the present dissertation has highlighted how critical life events influence personality development and how personality affects the processing of life events. However, there is another rationale for the influence of life events that has been studied almost as much as personality development: psychological well-being. A key indicator of well-being is life satisfaction, which reflects one's subjective overall assessment of the feelings and attitudes about one's life (Fujita & Diener, 2005; Linley et al., 2009). The close association between life satisfaction and life events can be illustrated with respect to the recent COVID-19 pandemic – a collective experienced life event (Wundrack et al., 2021) that has not been examined thoroughly and whose long-term consequences cannot yet be foreseen. Importantly, from what we know so far, it is becoming apparent that young adulthood represents a vulnerable life stage to experience this event (Buelow et al., 2021; Flesia et al., 2020; Ravens-Sieberer et al., 2021). The global pandemic (WHO, 2020) forced schools and universities to close, with young adults forced to adapt to online learning and digital communication for nearly two

years. In most countries, general mobility was restricted, significant personal events like graduations and proms were canceled, clubs and bars were closed, and meeting peers in person was nearly impossible. These COVID-19 mitigation measures required major adjustments and adaptive behavior from everyone, but had particularly severe negative effects for young adults who were already disadvantaged, such as due to a low socio-economic status (Buelow et al., 2021; Fosco et al., 2021; Ravens-Sieberer et al., 2021; WHO, 2020).

Conclusively, life satisfaction was found to decline due to this critical life event (Ammar et al., 2020; Arslan & Leung, 2021; Gawrych et al., 2021; Kimhi et al., 2020; Zacher & Rudolph, 2021). However, the COVID-19 pandemic represents a complex life event, and the evidence is inconclusive. Only a fraction of studies measured subjective life satisfaction longitudinally, and even fewer studies assessed how the COVID-19 pandemic was processed individually (e.g., Arslan et al., 2021; Gawrych et al., 2021; Gonzalez-Bernal et al., 2021). Specifically, keeping in mind research on the characteristics of life events, there is a need to explore not *whether* a young person experienced the COVID-19 pandemic but rather *how* a young person processed the COVID-19 mitigation measures and what underlying processes might account for differences in coping with the crisis. Ergo, on what basis were some people able to more easily cope with the difficulties the pandemic brought along, whereas others were more prone to struggle?

Core Beliefs

People differ in the rate, timing, and direction of their appraisal of critical life events (Fassbender, et al., 2021; Rakhshani et al., 2021; Luhmann et al., 2012). Resulting personality trait changes or effects on well-being can evolve in similarly diverse ways (Denissen et al., 2019; Fujita & Diener, 2005; Lucas et al., 2004; Luhmann et al., 2012). Thus, the question arises as to what contributes to individual differences in reactions to and processing of a critical life event. This question has been addressed from different angles. One approach is to dive deeper into implicit theories for a more thorough understanding of the processes and mechanisms that underly individual differences.

Individual differences in personality trait change appear to be most pronounced during young adulthood (Schwaba & Bleidorn, 2018), and according to Yeager et al. (2019), implicit beliefs are most important and salient during high-stakes developmental turning points such as puberty.

A possible explanation for this comes from core beliefs, which are described as mental representations that individuals hold about themselves, others, and the world in general (Dweck, 2017). In personality psychology, a lot of research has been conducted on beliefs about control (e.g., Bandura, 1997; Weiner, 1985). Internal control beliefs are defined as "beliefs about one's ability to bring about desired outcomes in relevant need domains" (Bandura, 1997, p. 699) and have been shown to function as an important coping resource when processing psycho-social stressors (Benight & Bandura, 2004; Luszczynska et al., 2009). Thus, the belief that one has control over a situation or oneself represents a powerful source for investigating how people approach life experiences.

Mindset. Dweck (2012) proposed a construct that encompasses assumptions about control beliefs as well as developmental approaches. As stated earlier, the author distinguished between growth and fixed mindsets. According to Dweck's (2012, 2017) propositions about human nature, it matters whether people believe that their core qualities are fixed by nature (entity theory or fixed mindset) versus malleable and thus able to change in response to nurture and personal efforts (incremental theory or growth mindset). Importantly, mindset is not static and can be changed throughout one's life (Dweck, 2012).

A person's mindset has been shown to influence various domains in life. For instance, a growth mindset has been shown to enhance the ability to successfully navigate challenging learning opportunities, resulting in academic success (Blackwell et al., 2007; Burnette et al., 2018; Yeager et al., 2019), and favorable outcomes in the workplace (Heslin & Vanderwalle, 2008; Kray & Haselhuhn, 2007). Moreover, differences in mindset have been associated with positive health outcomes with respect to, for example, physical activity (Biddle et al., 2003; Burnette & Finkel, 2012) and are thus considered a resilience factor in the face of challenges and setbacks (Dweck, 2012).

With respect to the latter, mindset could help to uncover the processes underlying personality trait change after critical life events. Accordingly, individuals who believe that their personal attributes are malleable might approach and adapt to environmental influences such as graduation or leaving their childhood home more easily, since they rely on resilient coping styles. Additionally, if they do not manage to attain the desired outcome, they are eager to learn from their mistakes. In contrast, individuals with a fixed mindset might react to challenging life events in a more rigid way, since they believe they cannot succeed anyway – and nothing can be done about it. However, open questions remain about long-term effects. Presumably, the mindset a young adult adopts could result in a further increase or decrease in related personality traits. For example, when a highly neurotic person faces the critical life event of graduation, thus, they may experience a lot of pressure, distress, and uncertainty about the situation. If this person has a fixed mindset, they will most likely attribute a negative experience with this event to unchangeable traits (Dweck, 2012), display negative affect, and engage in avoidant coping or even future failure avoidance (e.g., Magnus et al., 1993) – resulting in a further increase in neuroticism.

Self-Efficacy. Another core belief that is strongly related to internal control as well as implicit assumptions about the self is self-efficacy. Similar to mindset, the belief in one's innate abilities has been shown to promote health-related outcomes (Bandura, 1997; Benight & Bandura, 2004; Luszczynska et al., 2009), as well as subjective well-being (Luszczynska et al., 2005; Laks et al., 2013). Moreover, people high in self-efficacy tend to deal more effectively with potential stressors and also tend to experience a sort of buffer against undesired effects of environmental influences (Benight & Bandura, 2004; Laks et al., 2013). With regard to critical life events, self-efficacy might explain individual differences in personality change and subjective well-being (e.g., Weiss et al., 2012). For example, with respect to the COVID-19 pandemic, experiencing a greater amount of perceived control and confidence over the situation might affect subjectively perceived life satisfaction by buffering against the negative effects of the mitigation measures (e.g., Krampe et al., 2021; Zacher & Rudolph,

2021). In turn, people low in self-efficacy might experience consequences of the pandemic such as complying with health regulations and social distancing as more drastic, and thus, perceive the crisis as a threat and apply dysfunctional coping behaviors such as increased alcohol consumption (Zacher & Rudolph, 2021). This could result in a further decrease in self-reported life satisfaction.

Likewise, with respect to personality development, self-efficacy could determine how critical life events are processed (Cieslak et al., 2008; Laks et al., 2013). For example, when young adults high in intellect are confronted with a challenging life event such as moving away from the childhood home for the first time, they are most likely to approach the event with curiosity and take a proactive role. If they additionally have high levels of self-efficacy, they might experience the feeling of having control over the situation and be confident that they will be able to successfully navigate the transition into their new home. Thus, they will probably apply more problem-solving skills, seek out for helpful information, and engage in creative coping styles – which might result in a further increase in intellect.

Together, self-efficacy and mindset represent two core beliefs that might not only buffer against external stressors, but also determine the direction of individual differences in personality development and subjective well-being in response to critical life events.

Assessment of Critical Life Events

As recent as we have had a notion of when, why, and how critical life events interfere with our path in life, we have known a sophisticated way to operationalize them. Previously, critical life events were seen as distinct events that could examined in isolation and classified into dichotomous categories such as *experienced* versus *not experienced*. Hence, often only checklists of events or changes in demographic information were used to account for the occurrence of life events (e.g., Asselmann & Specht, 2021; Denissen et al., 2019; Leikas & Salmela-Aro, 2015; Loeckenhoff et al., 2009).

However, our knowledge regarding the assessment of critical life events has improved towards a better understanding of how to capture individual perceptions of life events. As noted earlier, the exact same life event can be perceived differently by different individuals (Bleidorn et al., 2020; De

Vries et al., 2021; Fassbender et al., 2021; Haehner et al., 2021; Luhmann et al., 2020; Rakhshani et al., 2021). For example, an introverted young adult might experience the consequences of the COVID-19 pandemic as less distressing, because staying at home and having fewer social interactions is both familiar to and favored by that person. Conversely, an extroverted person could experience social distancing rules as a huge intrusion on their daily life. Therefore, an isolated focus on the occurrence of life events might be biased and misleading (Luhmann et al., 2020).

In this context, the current dissertation builds on the most recent research and concentrates on event characteristics that are measured dimensionally, such as valence (Luhmann et al., 2020). Valence has been previously linked to personality change (De Vries et al., 2021; Haehner et al, 2021) and reflects dimensional, self-reported ratings of one's subjective experience of an event. Therefore, the kind of events becomes less important, allowing a fuller picture to be captured without forcing participants to choose from a list of pre-selected life events.

The Current Dissertation

Recent state-of-the-art reviews have made an urgent plea for larger and "rigorous longitudinal studies" investigating the stability and malleability of personality and exploring the processes that underlie the observed longitudinal associations between traits and life outcomes (Bleidorn et al., 2020; Bleidorn et al., 2021). The current dissertation attempts to respond to this call. Specifically, my dissertation seeks to conduct an in-depth investigation of the role of critical life events with regard to personality development and well-being while highlighting underlying processes such as core beliefs. Following this chapter, I present three empirical longitudinal studies, which provide a holistic picture of different aspects of critical life events and corresponding personality changes, personality developments on the facet level, life events and well-being, as well as the potential moderating roles of mindset and self-efficacy. In addition, the present dissertation places a particular focus on the assessment of critical life events.

The first study investigates whether two specific life events that are highly important for the critical age period of young adulthood – graduating from school and moving away from the childhood home – affect personality trait changes. Moreover, I examine whether personality development due to these life events is moderated by subjective perceptions of the event or the kind of mindset a young adult applies when encountering these events. The second study adds to empirical knowledge about these processes by investigating socialization and selection effects of personality change on a more pronounced basis. Here, I outline changes on the facet level and explore the development of trait intellect as it relates to subjective perceptions of life events. Again, this dissertation contributes to clarifying the associations with implicit beliefs by exploring a possible moderating role of self-efficacy. The third study aggregates previous findings on subjective event characteristics and concentrates on a precarious critical life event that has only recently emerged: the COVID-19 pandemic. The final study expands the scope of the current dissertation by considering the effects of life events on personal well-being. Thus, I investigate the development of life satisfaction in young adults via assessments before and during the pandemic. Furthermore, this dissertation once more considers the impact of control beliefs by examining the influence of self-efficacy on changes in life satisfaction during this period. To sum up, Figure 1 provides a simplified content overview of the studies conducted in this dissertation.

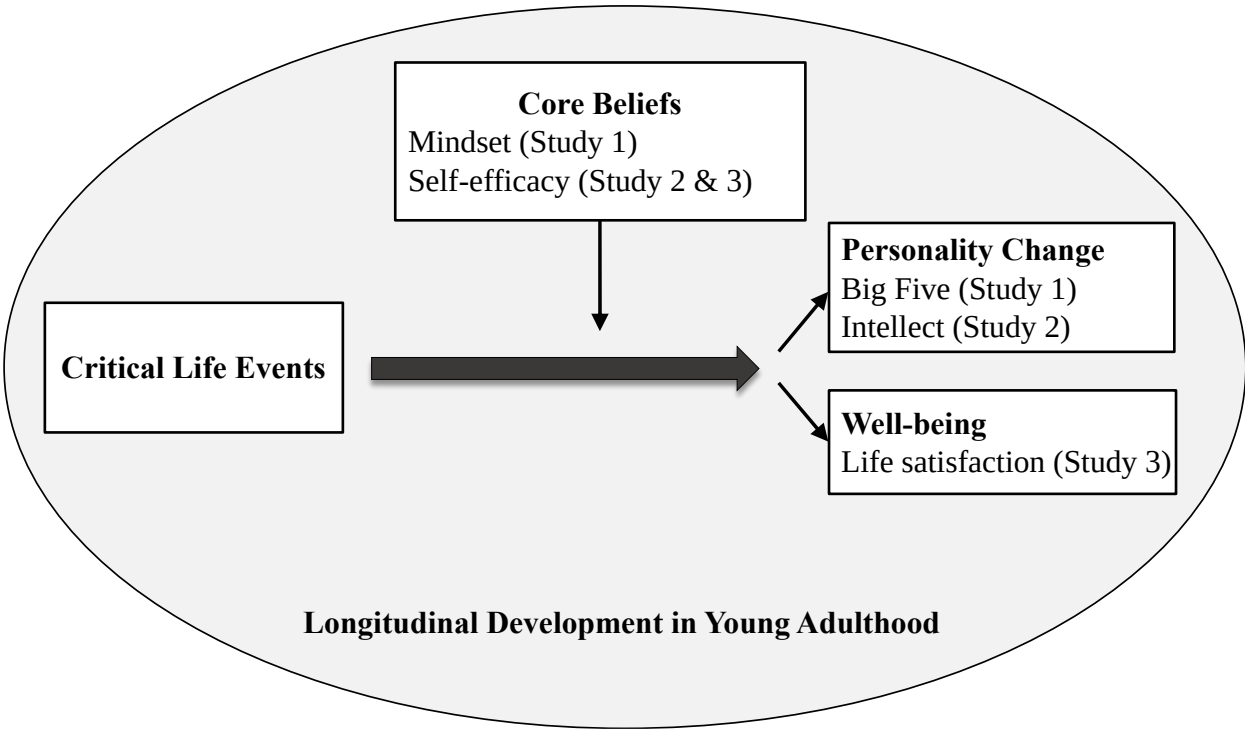

Figure 1. Content overview of studies conducted in this dissertation.

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Chapter 2

Personality Development in Emerging Adulthood –

How the Perception of Life Events and Mindset Affect Personality Trait Change

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Personality Development in Emerging Adulthood –

How the Perception of Life Events and Mindset Affect Personality Trait Change

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Abstract

Personality changes throughout the life course and change is often caused by environmental influences, such as critical life events. In the present study, we investigate personality trait development in emerging adulthood as a result of experiencing two major life events: graduating from school and moving away from home. Thereby, we examined the occurrence of the two life events per se and the subjective perception of the critical life event in terms of valence. In addition, we postulate a moderation effect of the construct of mindset, which emphasizes that beliefs over the malleability of global attributes can be seen as predictors of resilience to challenges. This suggests that mindset acts as a buffer for these two distinct events. In a large longitudinal sample of 1,243 people entering adulthood, we applied latent structural equation modeling to assess mean-level changes in the Big Five, the influence of life events per se, the subjective perception of life events, and a moderating role of mindset. In line with maturity processes, results showed significant mean-level changes in all Big Five traits. While no changes in the Big Five dimensions were noted when the mere occurrence of an event is assessed, results indicated a greater increase in extraversion and diminished increase in emotional stability when we accounted for the individual's (positive/negative) perception of the critical life event. In case of extraversion, this also holds true for the moderator mindset. Our findings contribute valuable insights into the relevance of subjective appraisals to life events and the importance of underlying processes to these events.

Keywords. personality development, life events, big five, mindset, emerging adulthood

Introduction

People change as they age. Individuals experience not only physical but also psychological changes across the entire lifespan. However, the exact course of internal and external changes depends on various criteria. In recent years, researchers have expended considerable effort in studying how personality develops across the lifespan; this has, in turn, incited a controversy about the stability and variability of specific personality traits. Personality traits are considered to be relatively stable individual differences in affect, behavior, and/or cognition (Johnson, 1997). Whereas the Big Five traits of conscientiousness and agreeableness appear to be rather stable and continuously increase across adulthood, levels of openness to experience appear to change in an inverted U-shape function, which increases between the ages of 18 and 22 and decreases between 60 and 70 (McCrae & Costa, 1999; Roberts & DelVecchio, 2000; Specht et al., 2011). Furthermore, some studies have shown that trait change can be associated with particular life stages. For example, the findings of Roberts and Mroczek (2008) suggest that young adults tend to exhibit increases in traits that are indicative of greater social maturity. More specifically, in emerging adulthood, the average individual experiences an increase in emotional stability, conscientiousness, and agreeableness (Arnett, 2000; Bleidorn, 2015; Roberts et al., 2006), and self-esteem (Orth et al., 2018), while openness to experience seems to decrease in advancing age (Roberts et al., 2006). Taken together, this comprises evidence that personality develops throughout the lifespan and consequently, several theories have been introduced to explain when and why personality change occurs (e.g., Baltes, 1987; Cattell, 1971; Caspi and Moffitt, 1993; McCrae & Costa, 1999; Roberts & Mroczek, 2008).

Critical Life Events

Theory and research support the idea that personality can change as a result of intrinsic factors such as genetics and extrinsic factors such as the environment around us (Bleidorn & Schwaba, 2017; Wagner et al., 2020). More specifically, there is ample evidence that personality is linked to certain external influences such as critical life events (e.g., Bleidorn et al., 2018; Luedtke et al., 2011). These

can be defined as "transitions that mark the beginning or the end of a specific status" (Luhmann et al., 2012, p. 594) and include leaving the parental home or major changes in one's status such as employment or duty. These transitions often require adaptation processes involving new behavioral, cognitive, or emotional responses (Hopson & Adams, 1976; Luhmann et al., 2012, 2014). Profound adaptations are assumed to have lasting effects, as "life events can modify, interrupt or redirect life trajectories by altering individuals' feelings, thoughts and behaviors" (Bleidorn et al., 2018, p. 83). Building upon this assumption, many studies have sought to determine how certain Big Five traits change because of critical life events. For instance, increases in emotional stability were found to result from transitioning into one's first romantic relationship (Lehnart et al., 2010). Emotional stability might also increase in anticipation of gain-based events such as childbirth or paid employment, which, in turn, lead to increases in conscientiousness and openness to experience (Denissen et al., 2018).

In the present study, we focus on two critical life events that are highly relevant for emerging adults: moving away from home and graduating from school. Both events represent a personal development milestone for the transition into adulthood and are typically associated with great educational or occupational challenges (Arnett, 2000; Pusch et al., 2018). Few studies have highlighted these two events and how they influence life trajectories in emerging adulthood. Luedtke et al. (2011) focused on the broader superordinate section of work-related life events and personality change and found that the transition from high school to college, university, or vocational training is associated with substantial normative increases in emotional stability, agreeableness, and conscientiousness. With regard to graduation from school, Bleidorn (2012) found significant mean- level changes in certain Big Five traits over an observation period of 1 year. Specifically, senior students experienced increases in conscientiousness, agreeableness, and openness after graduation. In a later review by Bleidorn et al. (2018), the authors found that graduation constitutes an almost universal life event in Western societies and that related change in adult personality is likely to be observable, because young adulthood is a

period in which personality traits have been shown to be most open to change (Lucas & Donnellan, 2011; Roberts & DelVecchio, 2000).

There are fewer investigations into the personality effects of moving away from home. Pusch et al. (2018) compared age differences in emerging vs. young adults and found that, among other life events, leaving the parental home did not reveal significant age effects with respect to personality change. However, they found significant age-invariant effects for individuals who left their parental home recently, indicating positive changes in agreeableness. Jonkmann et al. (2014) investigated living arrangements after college with regard to personality differences and found that, for example, the choice of living arrangement (living with roommates vs. living alone) predicted the development of conscientiousness and—to a lesser extent—openness and agreeableness. Similarly, according to a study by Niehoff et al. (2017), living and studying abroad after college led to increases in extraversion, agreeableness, and emotional stability. Interestingly, Specht et al. (2011) found a significant sex effect on leaving the parental home and argued that only women become more emotionally stable when moving. Taken together, this evidence suggests that moving away from home is a major life event that has not yet been deeply investigated but represents a distinct developmental task that has the potential to shape individuals' personalities.

The Perception of Life Events

While these studies provide valuable information about the impact of critical life events, one important issue has been hitherto neglected. Many past studies have focused on life events per se, but comparatively little effort has been made to examine the subjective appraisal of such events and its effect on the processes underlying personality change (Roberts, 2009). Moreover, methodological approaches to life events are sometimes misleading because the valence of experienced events is rated by either researchers or other people who cannot sufficiently reflect inter- and intra-individual experiences of events (Headey & Wearing, 1989; Kendler et al., 2003; Luhmann et al., 2020). However, there is ample evidence that people perceive the same event or situation very differently. For

example, according to a comprehensive review of person- situation transactions by Rauthmann et al. (2015), situations can be characterized by their physical (e.g., location, activity, persons) and/or psychological (e.g., task-related, threatening, pleasant) properties. Rauthmann et al. (2015) further state that "situations only have consequences for people's thinking, feeling, desiring, and acting through the psychological processing they receive" (p. 372). Thus, people's individual experiences of psychological situations may deviate from how these situations are experienced by most other people (reality principle). This assumption aligns with the TESSERA framework conceived by Wrzus and Roberts (2017). According to the authors, events and single situations can trigger expectancies about how to act and adjust in similar situations. These expectancies then determine which state occurs after the corresponding trigger by choosing a response from a variety of possible states (Wrzus & Roberts, 2017). Conjointly, two people can perceive the same situation or event very differently, leading to diverse reactions and psychological meanings.

A first step toward this important distinction was proposed by Luhmann et al. (2020), who aimed to systematically examined the effects of life events on psychological outcomes. To do so, the authors proposed a dimensional taxonomy which that considers nine perceived characteristics of major life events. I this way, the study uniquely emphasizes the difference between assessing the mere occurrence of a critical life event and taking into account subjective appraisal. However, significantly more research is needed to fully explore how this causes lasting personality trait change.

In conclusion, two aspects of person-situation transactions should be highlighted. First, one situation can be interpreted very differently by two individuals. Expectations and individual goals—as well as variable expressions of personality traits— influence the extent to which a situation is perceived as meaningful and, therefore, determine how people approach it (Bleidorn, 2012; Denissen et al., 2013, 2018). Second, this is also true for life events. Two people can reasonably experience the same major life event as completely differently. Therefore, we focus the present study on the valence of two distinct life events and use this characteristic as our central parameter. In particular, in emerging adulthood,

individuals might perceive the behavioral expectations and demands associated with a life event as more pressing than others (Pusch et al., 2018). What remains less clear is how situational perceptions affect personality change after a major life event, but with respect to the current string of literature, it seems reductive to only ask if, but not how, critical life events are experienced.

The Moderating Role of Mindset

In the previous section, we examined how diverse critical life events can be perceived. Here, we extend our theoretical approach by focusing on the underlying processes that might account for the different perception and spotlight causes of individual personality trait changes. One construct that is highly relevant to the aforementioned regulatory mechanisms is the individual belief system mindset. According to Dweck (1999), an individual's mindset refers to the implicit belief about the malleability of personal attributes. Dweck (1999) distinguishes between growth and fixed mindsets. The growth mindset emphasizes the belief that attributes like intelligence and personality are changeable. Conversely, the fixed mindset refers to the belief that such attributes are immutable. According to Dweck (2012), the individual mindset is not static and can be changed throughout one's life. Actively changing one's mindset towards a growth mindset was found to decrease chronic adolescent aggression, enhance people's willpower, and redirect critical academic outcomes (Dweck, 2012; Yeager et al., 2019). Moreover, Blackwell et al. (2007) found that the belief that intelligence is malleable (incremental theory) predicted an upward trajectory in grades over two years of junior high school, while the belief that intelligence is fixed (entity theory) predicted a flat trajectory. Yet, according to a meta-analysis from Sisk et al. (2018), mindset interventions for academic achievement predominately benefitted students with low socioeconomic status or who are at-risk academically. Mindset has also been linked to business-related outcomes (e.g., Heslin & Vanderwalle, 2008; Kray & Haselhuhn, 2007). That is, individuals with a growth mindset tend to use "higher-order" cognitive strategies and adapt to stress more easily (Heslin & Vandewalle, 2008). Likewise, mindset has been linked to health outcomes and even mental illness, with the assumption that a growth mindset buffers

against psychological distress and depression (e.g., Biddle et al., 2003; Burnette & Finkel, 2012; Schroder et al., 2017). Therefore, a growth mindset can be considered a predictor of psychological resilience (Saeed et al., 2018).

With regard to changes in personality traits, the findings have been mixed. Hudson et al. (2020) investigated college students' beliefs by adapting a personality measure into a mindset measure and administering it within a longitudinal study. They found that the mere belief that personality is malleable (or not) did not affect trait changes. However, in her Unified Theory of Motivation, Personality, and Development, Dweck (2017) suggests that basic needs, mental representations (e.g., beliefs and emotions), and action tendencies (referred to as BEATs) contribute to personality development. Dweck further argues that mental representations shape motivation by informing goal selection and subsequently form personality traits by creating recurring experiences (Dweck, 2017). Thus, there might be more information about indicators such as the integration of mindset, motivation, and environmental influences necessary to understand how personality traits change according to belief systems.

In summary, there is evidence that a belief in the malleability of global attributes allows individuals to adapt to life circumstances in a goal-directed way and that individuals' mindsets determine responses to challenges (Dweck & Leggett, 1988). Building upon the existing literature around environmental influences on personality traits and the diverse effects of mindset, we argue that after experiencing a critical life event, individuals with a growth mindset will adapt to a new situation more easily and accordingly exhibit greater change in relating personality traits. In contrast, individuals with a fixed mindset might react in a more rigid way to unknown circumstances and thus do not experience the need adapt, resulting in no personality trait change.

The Present Study

This study aims to contribute to the literature around external and internal influences on personality development in emerging adulthood by analyzing changes in the Big Five, the influences

of the occurrence of life events *per se* versus their subjective perception, and the possible moderating effects of mindset in a longitudinal study with a large sample. Most prior studies have focused on personality development in adulthood (e.g., Damian et al., 2018; Denissen et al., 2018; Lucas & Donnellan, 2011; Roberts & Jackson, 2008; Wrzus & Roberts, 2017), but emerging adulthood is marked by tremendous changes; thus, we focus our analyses on this period. According to Arnett (2000, 2007), emerging adulthood is considered a distinct stage between adolescence and full-fledged adulthood. This is seen as a critical life period because it is characterized by more transformation, exploration, and personality formation than any other life stage in adulthood (Arnett, 2000; Bleidorn & Schwaba, 2017; Ziegler et al., 2015). With regard to beliefs systems, Yeager et al. (2019) argue that beliefs that affect how, for example, students make sense of ongoing challenges are most important and salient during high-stakes developmental turning points such as pubertal maturation. For this reason, it is particularly compelling to investigate environmental influences such as major life events that shape the trajectory of personality trait change in emerging adulthood.

To do so, we examined whether two major critical life events (graduating from school and moving away from home) affect personality development. We chose these two major life events because they are uniquely related to emerging adulthood and because existing research has found mixed results regarding their influence on personality trait change (e.g., Luedtke et al., 2011; Pusch et al., 2018; Specht et al., 2011). Based on prior findings, we constructed three hypotheses. First, we expect that an increase in personality trait change will occur in individuals who graduate from school/move away from home but not in those who did not experience such events. Second, subjective perceptions of the two critical life events will influence personality trait changes in the Big Five. Third, we look at the underlying processes that influence personality and argue, that mindset will moderate the impact of the two stated life events/perception of life events on personality trait change.

Method

Sample and Procedure

For this study, we created the German Personality Panel (GEPP) by collecting data from a large German sample in cooperation with a non-profit online survey provided by berufsprofiling.de. This organization assists emerging adults by providing job opportunities and post-graduation academic pathways. After completing the questionnaire, participants received feedback and vocational guidance. In 2016 and 2017, a total of 11,816 individuals between 13 and 30 years old (*M* = 17.72 years; *SD* = 3.22, 50.71% female) took this survey. We used this first round of data-gathering as our longitudinal measurement occasion T1. If participants consented to be contacted again, we reached out via email in October 2018 to request their participation in a second survey. A total of 1,679 individuals between 14 and 26 years old (*M* = 17.39, *SD* = 2.37, 64.82% female) agreed to participate and filled in a second online survey (second measurement occasion of GEPP, T2). The test battery at T2 took approximately 30 to 40 minutes, and we provided personalized feedback on personality development, as well as a monetary compensation, to all participants. Because we were interested in emerging adults who were about to graduate from school and thus found themselves in a critical time period, we excluded all participants older than 21 at T2. On the other hand, we included 14-year-old participants because they could have entered school in Germany at the age of five and thus graduated from secondary school and/or moved away from home by this age. At T2, 12% had not yet finished school, 32% held a secondary school certificate, and 57% held a university entrance diploma.

To further improve data quality, we obtained an indicator for careless responding by asking about self-reported diligence ("Did you work conscientiously on the test?"). Participants were informed that their answer had no impact on their compensation. At T2, 41 (3%) participants answered "No." After excluding participants meeting this criterion, a sample of n = 1,243, aged 14–21 years (*M* = 16.92, *SD* = 1.75, 67.23% women), remained for subsequent data analyses. All data and further materials are available via osf (https://osf.io/xc6d4/?view_only= 5b913c97553d48a290b75a3f725aca3d).

Sample Attrition

Numerous email accounts were invalid at the second measurement point—for example, because students' personalized school email accounts were deleted following their graduation or because certain institutions used only a single email account to offer vocational counseling to college students (N = 3,495). Those who did not participate at the second measurement point (dropouts) were slightly younger than those who participated (continuers) [M(ageD) = 17.39; M(ageC) = 17.76; $p \leq .000$, d = −.12] and more women filled in the second questionnaire (dropouts = 50.9% women, continuers = 64.8% women; $p \leq .000$, d = .31). Only modest selectivity effects (measured by Cohen's d) in terms of mean differences in personality traits between dropouts and continuers were found at T1; thus, there was negligible systematic attrition (Pusch et al., 2018; Specht et al., 2011). Continuers had slightly higher scores in agreeableness (d = .17), conscientiousness (d = .19), and openness (d = .16) than dropouts, but were almost identical in terms of extraversion (d = −.08) and emotional stability (d = .01).

Measures

Personality. Personality traits were assessed on both measurement occasions using a short version of the Big Five personality inventory for the vocational context (TAKE5; S&F Personalpsychologie Managementberatung GmbH). The TAKE5 has been shown to be a highly reliable and valid personality measure (Mussel, 2012). In the short version of the test, each of the Big Five subscales (openness to experience, conscientiousness, extraversion, agreeableness, and emotional stability) consists of three items and was measured on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Example items for conscientiousness include (translated from German): "Nothing can stop me from completing an important task", "People around me know me as a perfectionist", and "My work is always carried out the highest quality standards". Items were selected to cover the different aspects of each domain therefore internal consistencies provide no valuable indicator. Test-retest reliabilities for the TAKE5 between T1 and T2 were .69 for extraversion, .52 for

openness to experience, .57 for conscientiousness, .58 for agreeableness, and .50 for emotional stability. Small to moderate reliability levels can be explained by the heterogeneity of the items and our attempt to capture rather broad personality constructs. Similar results have been reported for other brief personality scales (Donnellan et al., 2006; Rammstedt et al., 2016). All descriptive statistics and correlations can be found in Table 1, and bivariate correlations of all items can be found at osf (https://osf.io/xc6d4/?view_only=5b913c97553d48a290b75a3f725aca3d).

Table 1.
Correlations and descriptive statistics among variables

				Correlations												
Variables	*N*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Extraversion T1	1,243	4.25	1.22													
2 Agreeableness T1	1,243	4.49	1.24	.05*												
3 Openness T1	1,243	4.19	.94	.26***	.11***											
4 Emo. Stability T1	1,243	4.18	1.09	.15***	.39***	.07*										
5 Conscientiousness T1	1,243	4.53	1.15	.10***	.10***	.22***	.19***									
6 Extraversion T2	1,243	4.39	1.29	.68***	.05	.20***	.12***	.05*								
7 Agreeableness T2	1,243	4.50	1.33	-.03	.57***	.05*	.23***	.05*	.02							
8 Openness T2	1,243	4.47	.95	.23***	.06	.51***	.08**	.10***	.29***	.09**						
9 Emo. Stability T2	1,243	4.25	1.29	.12***	.28***	.00	.50***	.10***	.19***	.39***	.10***					
10Conscientiousness T2	1,243	4.78	1.12	.08	.06*	.10***	.11***	.57***	.10***	.06*	.14***	.12***				
11 Mindset	1,243	3.62	1.45	.00	.10***	.15***	.08**	.09**	.04	.15***	.14***	.13***	.04			
12 Life Event 1	1,030	5.48	1.43	.05	.03	.02	.12***	.07	.03*	.06	.03	.17***	.04**	.06*		
13 Life Event 2	698	4.75	1.51	.06	.01	.07*	.03*	.09*	.03	.00	.08*	.09**	.00	.04	.17***	

Note. *N* = Sample size, *M* = Mean, *SD* = Standard deviation, Life Event 1 = Perception of graduating from school, Life Event 2 = Perception of moving away from home, *** $p < .001$; ** $p < .01$; * $p <. 05$.

Life Events. In the present study, we focus on two major life events that are highly characteristic of the critical period between the late teens and young adulthood (Arnett, 2000; Bleidorn, 2012; Luedtke et al., 2011): moving away from home and graduating from school. At T2, after completing the personality questionnaire, participants rated their subjective perception of each of the two life events on a dimensional 7-point Likert scale (1 = *very negatively*, 7 = *very positively*). Of the initial sample, 68.38% of the participants had graduated from school, 47.66% had moved away from home, and 46.96% had experienced both life events. Participants who had graduated from school were older (M = 17.32 years, SD = 1.84, female = 68.80%) compared to those who had not yet finished school (M = 15.30 years, SD = 1.09, female = 68.21%). Those who had moved away from home were approximately 1 year older (M = 17.53, SD = 1.89, female = 69.30%) compared to those did not yet move away (M = 16.29, SD =1.69, female = 66.91%). To avoid potential confounding effects, we only asked about events that had happened within the past year (after the first measurement occasion). This allowed us to account for experiences that took place before T1.

In the second step, in order to obtain a fuller picture, participants also had the option of rating an additional significant life event from a list of 18 potential life events from various domains—such as love and health—based on the Munich Life Event List (MEL; Maier-Diewald et al., 1983). However, the number of individuals who experienced these other life events was too small to allow for further analyses.

Mindset. Participants' mindset was measured with a questionnaire based on Dweck's Mindset Instrument (DMI). The 16-item DMI was developed and created by Dweck (1999) and is used examine how students view their own personality and intelligence. In the current study, only items concerning beliefs about the malleability of personality were used. The mindset inventory items were "Personality traits are something a person cannot change", "You have a certain personality and you really can't do much to change it", and "You can learn new things, but you can't really change your basic personality". At T2, participants were presented a 7-point response scale, ranging from 1 (*strongly disagree*) to 7

(*strongly agree*) (*M* = 3.60, *SD* = 1.45). Items were reversed such that higher levels indicated a growth mindset. This short inventory was found to be highly reliable (*M* = 3.60, *SD* = 1.45, ω = .81, 95% CI [.70, .84]).

Statistical Analyses

Analyses were carried out in four steps. First, we conducted confirmatory factor analyses to test for measurement invariance across time points T1 and T2. Second, we constructed latent difference score models for all Big Five scales to test for mean differences in personality traits. Third, we investigated the impact of the life events moving away from home and graduating from school, as well as the perception of these two events on changes in the Big Five. Fourth, we added mindset as a moderator to the model. All statistical analyses were carried out in R and R Studio 1.2.1335 (R Core Team, 2018).

Measurement Invariance. To ensure that the same construct was being measured across time, we first tested for measurement invariance. For weak measurement invariance, we fixed the factor loadings for each indicator to be equal across measurement occasions and compared this model to the configural model, where no restrictions were applied. The same procedure was followed to assess strong measurement invariance, with the weak invariant model compared to a model with constrained intercepts to equality across time (e.g., the same intercept for Item 2 at T1 and Item 2 at T2) (Newsom, 2015). To evaluate the model fit, comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were inspected. Good fit was considered to be indicated when CFI and TLI values were .90 or higher, RMSEA below .08, and SRMR values below .05 (Hu & Bentler, 1999; Marsh et al., 2005). The configural model showed good fit for all of the Big Five traits (All χ^2[4 24], *df* = 5, *CFI* > [.98 1.00], *TLI* > [.94 1.00], *RMSEA* < [.00 .06], *SRMR* < [.00 .02]). Model fit for partial strong measurement invariance revealed similar fit (all χ^2[9 50], *df* = 8, *CFI* > [.96 1.00], *TLI* > [.92 1.00], *RMSEA* < [.01 .07], *SRMR* < [.01 .03]) when freely estimating the intercept of the first manifest OCEAN item (Cheung

& Rensvold, 2002; Little et al., 2007). All further analyses are based on this model and full results for fit indices are presented in Table S1.

Latent Change Score Models. To test for changes in personality over time, we applied latent structural equation modeling analysis with the R package lavaan (version 0.5-23.1097; Rosseel, 2012). Required sample size for the specified latent change score model was estimated by the R-toolbox semTools (Jorgensen et al., 2018; MacCallum et al., 2006) for *RMSEA* = .05, *df* = 16, α = .05, and a statistical power of 90% to N = 672 individuals. Therefore, we consider our sample size to be sufficiently large.

As we were first interested in the rate of change, we built a multiple-indicator univariate latent change score model for each of the Big Five domains (Figure 1). Each latent construct of interest (OCEAN) consisted of three observed measures (X1, X2, and X3) at two waves. Equality constraints were imposed on factor loadings and intercepts (Newsome, 2015). Moreover, the autoregressive path was set equal to 1. The means, intercepts, and covariances at the first occasion and for the difference score factor were freely estimated, and all measurement residuals were allowed to correlate among the sets of repeated measurements (McArdle, 2009). We accounted for missing data by applying robust maximum likelihood estimation. Finally, after specifying this basic model, the variables of interest – the occurrence of the life event, perception of the life event, and the moderator mindset– were added to the model.

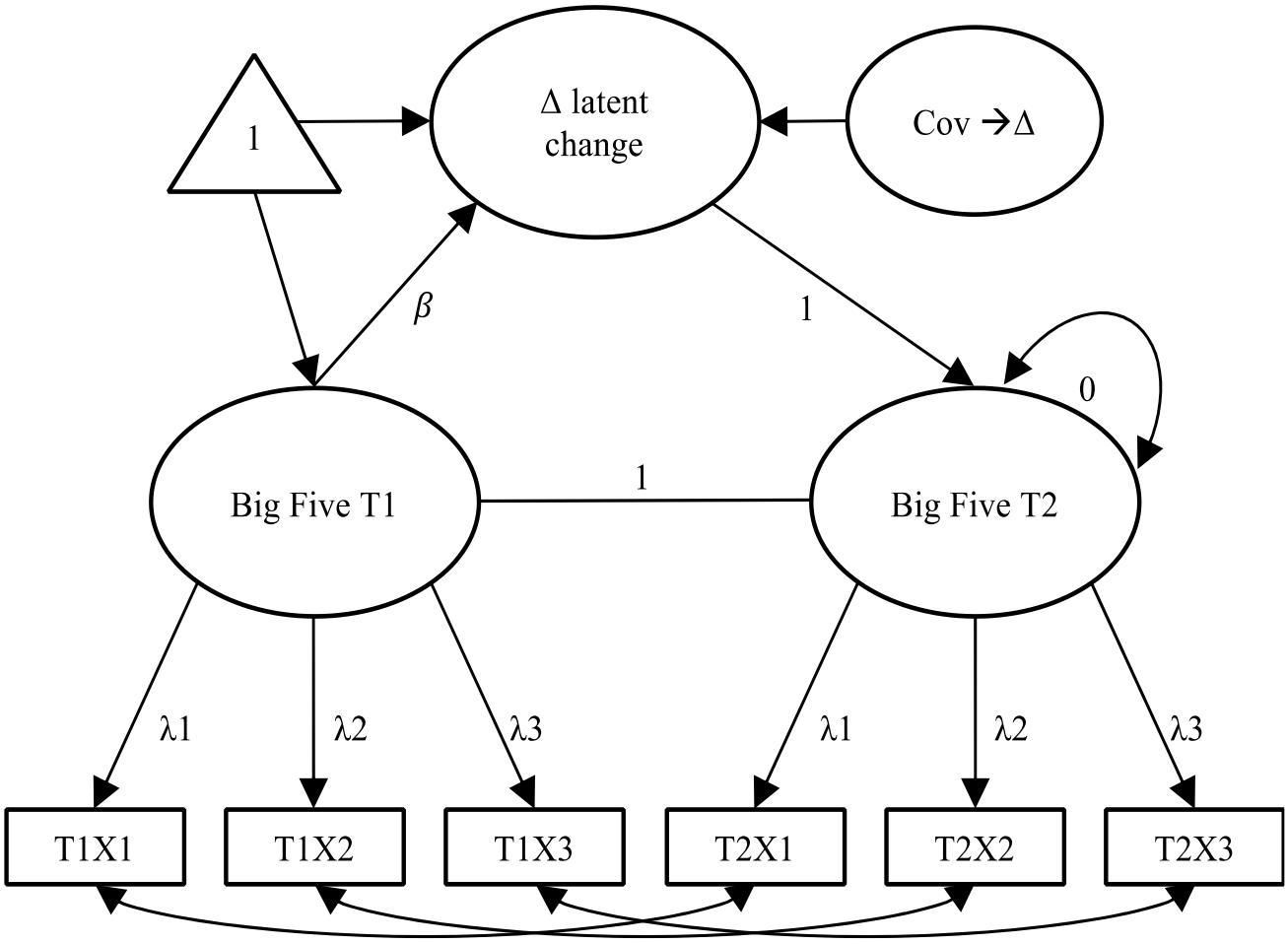

Figure 1. Schematic model of the multiple-indicator univariate latent change score model. The latent construct of interest (each personality trait) was measured at two time points (T1 and T2), using three indicators each time (X1, X2, X3). The lower part of the model constitutes the assessment of measurement invariance. "Δ latent change" captures change from the Big Five trait from T1 to T2. Latent regressions from "Δ latent change" on Cov→Δ reflect the influence of the covariate *perception of life event* or the moderator *mindset* on the development of the Big Five. Straight arrows depict loadings and regression coefficients, curved arrows co-variances.

Results

Mean Level Change

Standardized mean differences were calculated as an average of all intra-individual increases and decreases in a given personality trait over time. As illustrated in Figure 2, all latent mean scores for the Big Five increased from T1 to T2.

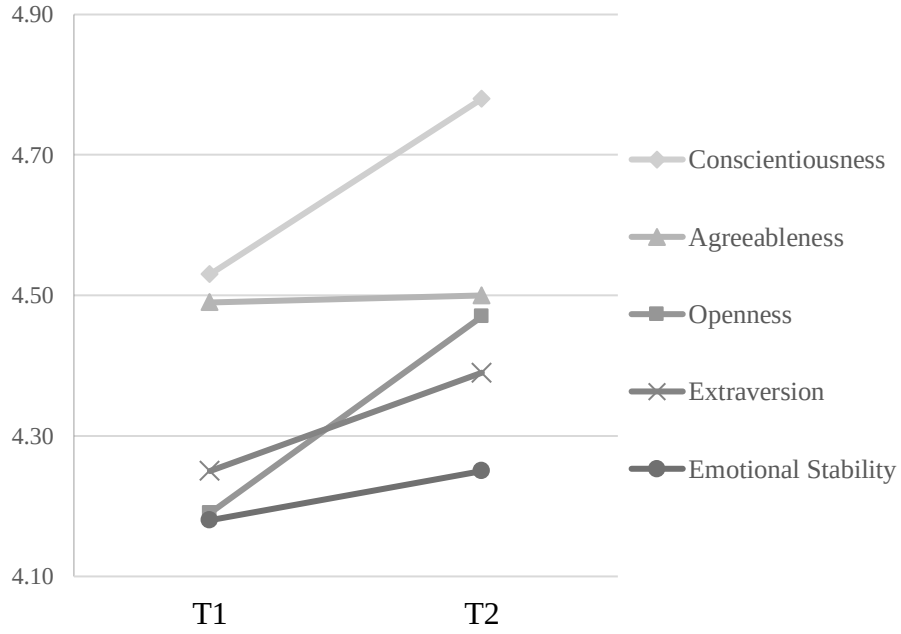

Figure 2. Mean-level changes in Big Five dimensions over measurement occasions T1 and T2

Conscientiousness and openness to experience exhibited the largest mean-level changes from T1 to T2, whereas agreeableness (d = .02) and emotional stability (d = .07) remained nearly the same. To test for changes in personality, we employed a multiple-indicator univariate latent change score model. Separate models for each of the Big Five all fit the data well (all *CFI* > .95, *TLI* > .93, *RMSEA* < .05, *SRMR* < .04). Inspecting the intercepts of the change factors revealed that all Big Five scores changed between T1 and T2, with less increase among individuals with high compared to low levels at T1. The latent means for each personality dimension at each time point, along with their fit indices, are reported in Table 2.

Table 2.
Big Five mean-level change from T1 to T2 with fit indices, n = 1,243

Big Five	*M* T1	*M* T2	*d*	χ2(df)	*p*(χ2)	CFI	TLI	RMSEA	RMSEA 90%CI	SRMR	$\mu\Delta$
Extraversion	4.25	4.39	.11***	23.56 (10)	.00	.99	.90	.03	[.03 - .06]	.03	.73***
Agreeableness	4.49	4.50	.01	27.28 (10)	.00	.99	.99	.04	[.01 - .05]	.03	1.38***
Openness	4.19	4.47	.30***	52.04 (10)	.00	.95	.93	.06	[.04 - .07]	.04	2.19***
Emotional Stability	4.18	4.25	.06	45.77 (10)	.00	.97	.96	.05	[.02 - .05]	.04	.81***
Conscientiousness	4.53	4.78	.22***	10.70 (10)	.00	1.00	.99	.01	[.00 - .03]	.02	1.63***

Note. *M* T1 = Mean at measurement occasion 1; *M* T2 = Mean at measurement occasion 2; *d* = (mean at Time 2 – mean at Time 1)/ baseline standard deviation; χ2 = chi square difference statistic; df = degrees of freedom; *p*(chi2) = significance of chi square difference statistic; CFI = Comparative Fit Index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; SRMR=standardized root mean square residual; $\mu\Delta$ = intercept of latent change score; *p*($\mu\Delta$) = significance of latent change score
*** $p < .001$; ** $p < .01$; * $p < .05$.

Life Events and Perception of Life Events

To assess personality trait change resulting from experiencing a life event, we included a standardized dichotomized variable "experiencing the life event versus not" into the model. Again, the model fit the data well for both critical life events (all *CFI* > .94, *TLI* > .92, *RMSEA* < .05, *SRMR* < .04). However, comparing participants who had experienced one of the critical life events (moving away from home or graduating from school) to those who had not revealed that neither life event had a significant impact on changes in personality traits between T1 and T2 ($p > .05$).

To assess personality trait change resulting from perception of a life event, we included the standardized variable "perception of the life event" for each of the two events into the model and regressed the latent change score on the covariate. This time, results regarding the subjective perception of the life event graduating from school indicated a significant impact on personality change for emotional stability ($\chi 2[16] = 94.07$, *CFI* = .92, *TLI* = .90, *RMSEA* = .07, *SRMR* = .05, $\lambda = .05$, $p[\lambda] < .05$). Specifically, participants who had experienced graduating from school more negatively exhibited a diminished increase in emotional stability than compared to individuals who had experienced graduating from school more positively. We also found evidence that subjective perceptions are relevant for extraversion. A greater positive change in extraversion was observed when participants experienced graduating from school more positively than compared to negatively ($\chi 2[16] = 23.90$, *CFI* = .99, *TLI* = .99, *RMSEA* = .02, *SRMR* = .03, $\lambda = .10$, $p[\lambda] = .05$). Subjective perceptions moving away from home had no impact on trait changes in any of the Big Five traits. Descriptive statistics for the life events along with model fit indices can be found in Table S2.

Mindset

To test for a moderating role of mindset, an interaction term between mindset and each of the two critical life events was constructed. First, we built an interaction term between mindset and the dichotomous variable "experienced the life event" and regressed the latent change factor on the interaction term. Separate models for each of the Big Five all fit the data well (all *CFI* > .94, *TLI* > .92,

RMSEA < .05, *SRMR* < .05). As shown in Table S3, no effects for the Big Five traits were significant for the distinction between experienced the life event versus did not experience the life event ($p > .05$). Second, for each of the two life events an interaction term between mindset and perception of the life event was built analogously. For extraversion, we found a significant influence of the moderator when assessing the perception of graduating from school ($\chi 2[16] = 25.62$, *CFI* = .99, *TLI* = .99, *RMSEA* = .03, *SRMR* = .03, $\lambda = -.09$, $p[\lambda] = .05$). Hence, a fixed mindset indicates less change in extraversion when experiencing the critical life event graduation from school. More specifically, regarding manifest means of extraversion, participants with a growth mindset experienced almost the same amount of increase in extraversion over time, regardless of their perception (positive or negative) of the critical life event. On the other hand, participants with a fixed mindset only show an increase in extraversion when they experienced the life event more positively (see Figure 3). No effects for the interaction between mindset and the critical life event moving away from home were significant.

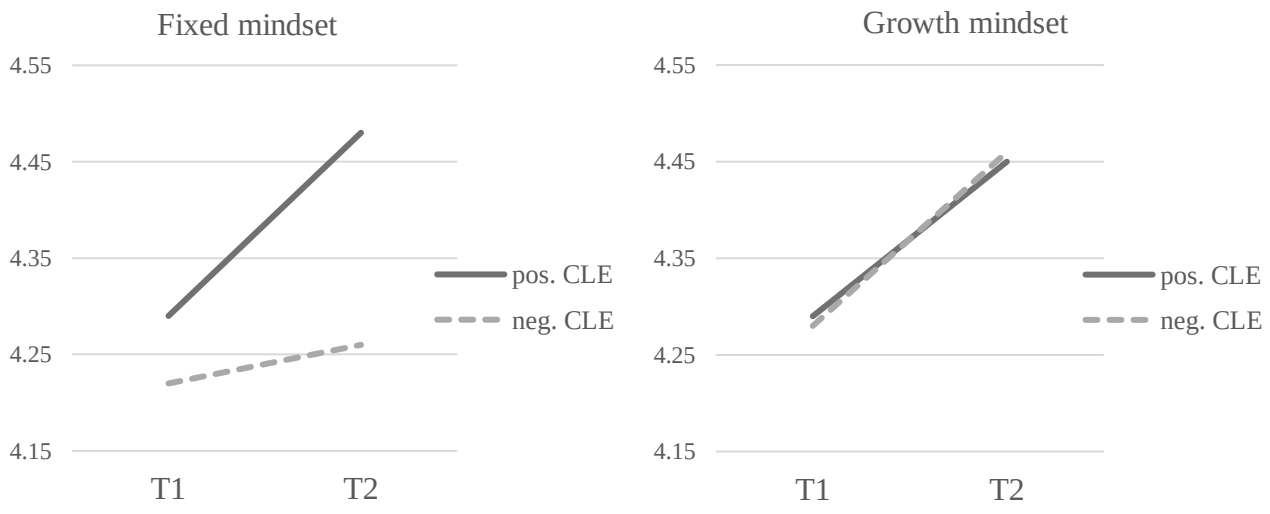

Figure 3. Change in trait extraversion for people with a fixed versus growth mindset with regard to the perception of life event *graduation from school*

Discussion

The purpose of the present study was to investigate the effect of external sources such as life events and internal dispositions like the mindset on personality trait change. We assert that exploring whether the subjective experience of life events is associated with personality trait development constitutes an important future directions in various domains of personality research. Therefore, we took a closer look at the underlying processes, particularly as they relate to individual differences in situational perceptions and belief systems. We investigated how two critical life events (moving away from home and graduating from school) influence personality trait change, the role of subjective perceptions of these events, and how internal belief systems like mindset moderate the impact of life events on trait change.

Mean-Level Change

Since our sample was selected to be between 14 and 21 years of age, most of our participants were classified as emerging adults Arnett, 2000, 2007. A large body of research has consistently demonstrated that emerging adulthood is characterized by trait changes related to maturity processes (for an overview, see Roberts et al., 2006). Thus, emerging adults tend to experience increases in conscientiousness, emotional stability, openness, and (to a lesser degree) agreeableness. This pattern is often called the "maturity principle" of personality development, and it has been found to hold true cross-culturally (Bleidorn, 2015; Roberts & Jackson, 2008). Although the effects were small, we found evidence for mean-level changes in line with the maturity principle and functional personality trait development. Extraversion, openness, agreeableness, conscientiousness, and emotional stability significantly increased over the 1-year period. The largest changes were found for openness and conscientiousness. These changes are most likely to be explained by attempts to satisfy mature expectations and engage in role- congruent behavior. While increases in openness might be due to identity exploration, higher scores on conscientiousness could reflect investment in age-related roles.

Individuals might, for instance, take increased responsibility for social or career-related tasks that require more mature functioning (Arnett, 2000, 2007).

Life Events

First, we analyzed whether the occurrence of a life event *per se* had an influence on personality trait change. In our study, neither of the critical life events—moving away from home or graduating from school—affected Big Five trait change over the two measurement occasions. One possible explanation is that the two chosen life events were not prominent enough to evoke far-reaching changes in personality traits (Loeckenhoff et al., 2009; Magnus et al., 1993). In line with a study by Loeckenhoff et al. (2009), more stressful, adverse events might have triggered more pronounced and predictable effects on personality traits. Moreover, the period between the late teens and early adulthood is characterized by a large number of stressful events and daily hassles (Arnett, 2000, 2007). In a comprehensive review of emerging adulthood by Bleidorn and Schwaba (2017), graduates also experienced changes in other personality traits, such as openness and emotional stability, which suggests that many developmental tasks and major life transitions contribute to changes in Big Five trait domains. Furthermore, according to Luhmann et al. (2014) and Yeager et al. (2019), life events may not only independently influence the development of personality characteristics, but they might also interact with one another. Researchers must address the interpretation of other challenges that adolescents experience. This notion is also supported in a study by Wagner et al. (2020), who introduced a model that integrates factors that are both personal (e.g., genetic expressions) and environmental (e.g., culture and society). The authors assert that the interactions and transactions of multiple sources are responsible for shaping individuals' personalities, and, in order to understand how they interact and develop over time, more integrated research is needed. Future studies should focus on a wider range of important life events and environmental influences during emerging adulthood and account for possible accumulating effects.

Second, and perhaps most remarkably, our findings revealed a different picture after we analyzed how the two critical life events were perceived. When participants experienced graduating from school negatively, a greater decrease in emotional stability was observed. Conversely, when the event was evaluated positively, a greater positive change in extraversion was reported. There are clear theoretical links between these two traits and the perception of life events in terms of emotional valence. While low emotional stability encompasses a disposition to experience negative emotions such as fear, shame, embarrassment, or sadness (especially in stressful situations), extraverted individuals are characterized by attributes such as cheerfulness, happiness, and serenity (Depue & Collins, 1999; Goldberg, 1990). In line with the notion of a bottom-up process of personality development (Roberts et al., 2005), experiencing a major life event as either positive or negative might lead to a prolonged experience of these emotions and, thus, ultimately to altered levels of the corresponding personality traits. These findings are in line with previous research on subjective well-being (SWB). In fact, variance in SWB can be explained by emotional stability and extraversion, indicating a robust negative relationship between low emotional stability and SWB and a positive relationship between extraversion and SWB (Costa & McCrae, 1980; Headey & Wearing, 1989). Moreover, Magnus et al. (1993) found selection effects for these traits, suggesting that high scorers in extraversion experience more subjectively positive events, and low scorers in emotional stability experience many (subjectively) negative events (see also Headey & Wearing, 1989).

Mindset

In the present study, we found evidence of a moderating influence of mindset on the impact of the life event graduating from school for the trait extraversion. Our results indicate that people with a growth mindset show greater change in extraversion, almost regardless of whether they experienced the life event more negatively or more positively. On the other hand, the present results indicate that people with a fixed mindset show an increase in extraversion after experiencing a life event more positively, but almost no change in extraversion when experiencing graduating from school negatively.

Interestingly, we only found effects for extraversion. As previously mentioned, trait extraversion stands for behavioral attributes such as how outgoing and social a person is, and this is related to differences in perceived positive affect (Goldberg, 1990; Magnus et al., 1993; Roberts et al., 2005). The characteristics of extraversion can be linked to the assumption that people with a growth mindset show greater resilience (Schroder et al., 2017; Yeager et al., 2019), especially in the face of academic and social challenges (Yeager & Dweck, 2012). Thus, people who believe that their internal attributes are malleable confront challenges such as graduation by adapting and learning from them; our findings suggest that this results in an increase in extraversion. By contrast, people who believe that they cannot change their personality characteristics might attribute a negatively experienced graduation to external circumstances out of their control. Thus, they do not rise from a negative life event and experience no impetus to become more extraverted.

The above notwithstanding, more research is needed, as we found no evidence for the other Big Five personality traits. Further, the relationship between mindset and personality is complex to disentangle. We examined only two major life events in this first attempt. More attention is needed with respect to other life events and their interplay with internal belief systems and implicit theories to explore possible far-reaching effects on behavior.

In summary, the present study makes an important contribution to the literature on personality development in emerging adulthood with a special focus on external and internal influences and the assessment of critical life events. Our findings support the notion of a dimensional approach to life events, as introduced by Luhmann et al. (2020), in contrast to a typological approach. With regard to research on situational perception, it seems reductive to examine the occurrence of certain life events rather than their subjective perceptions. As previously mentioned, many studies emphasize that 1) events and single situations can trigger expectancies about how to act and adjust in similar situations (TESSERA framework, Wrzus & Roberts, 2017); 2) psychological situations and person-situation

transactions deviate from one another (Rauthmann et al., 2015); and 3) regulatory mechanisms influence the variability in individual personality trait change (Denissen et al., 2013).

Again, further research is needed to explore the underlying processes behind critical life events and their impact on personality trait changes. In doing so, great care should be taken in selecting life events with a strong social and emotional component with respect to individual perceptions. Finally, there is also a need for more research into the selection of life events being assessed with regard to their interplay.

Limitations and Future Directions

Our research demonstrates the importance of examining the underlying processes behind personality changes that arise from external influences such as life events. One of the strengths of this study was our large sample, which comprised N = 1,679 German emerging adults and allowed us to use powerful statistical methods. One limitation was that we gathered data across a one-year time interval with only two measurement occasions. As noted by Luhmann et al. (2014), the inclusion of more than two measurement points makes it easier to distinguish between sudden short- or long-term shifts and more gradual linear changes. With this in mind, it is possible that critical life events correlate with temporary disruptions of personality maturation; tracing the impact of a single life event on personality trait change might not be as straightforward as is often assumed. Moreover, two measurement occasions can only reveal the immediate effect of life events on personality traits and may, therefore, neglect long-term effects that become salient after more time has passed. Future studies should also incorporate more characteristics of life events. We concentrated our study on the valence of critical life events, but other features –such as impact, challenge, and predictability– could reveal a more comprehensive picture (Luhmann et al., 2020).

Another limitation of the present study is that all our data relied on self-report personality measures. Even though almost all research on personality change is based on self-report measures, the influence of (for example) self-concepts cannot be neglected. Self-reported data might thus depart from

other types of data in terms of differential stability, for example (Wagner et al., 2020). Hence, changes in the Big Five domains might reflect subjective rather than observable changes in personality. At the same time, we believe that our approach of assessing personality traits and the perception of life events gives valuable insights into personality development, since we focused on how individuals consciously understand their experiences. Nevertheless, it would be informative to compare both approaches (observer and self-reported data) to examine how they complement one another (see also Bleidorn et al., 2020).

Yet another important issue that must be mentioned are our attrition effects. As previously stated, the data for the first measurement occasion was gathered through a non-profit self-assessment test intended to help students explore post-graduation occupational opportunities. Hence, our sample might be prone to selection effects and confounding preexisting differences: only emerging adults who were concerned about their future might have taken the test in the first place. The self-selection to voluntarily participate in a research study might also explain the higher percentage of female participants. Moreover, some of the Big Five traits from T2 dropouts were correlated with T1 personality traits. Therefore, our results should be interpreted with caution; participants with low conscientiousness, for example, might have been more likely to drop out or have been excluded from our study due to the diligence check, and thus conscientiousness could have risen over the study period because the sample composition shifted between T1 and T2. Nevertheless, the noted differential attrition effects were rather small and reflect only modest selectivity (see also Luedtke et al., 2011; Specht et al., 2011).

Finally, we did not examine cultural differences. With our German sample, we only investigated patterns in a modern Western industrialized country. Hence, we did not control for different cultural and demographic backgrounds, and our results might thus not be applicable to a broader range of individuals.

Conclusion

The present research improves our understanding of personality trait development during the critical period of emerging adulthood and demonstrates the importance of examining the underlying processes behind personality changes that arise from external influences such as life events. We showed how two critical life events can shape and adjust life trajectories, which is a necessary step toward gaining a comprehensive picture of the underlying processes of personality trait change across the life course. In addition to changes in the operationalization of life event research, larger and more diverse samples over more measurement occasions are needed to further explore how individual perceptions and internal belief systems influence our personality during and after experiencing critical life events.

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CHAPTER 3

The Development of Intellect in Emerging Adults:

A Longitudinal Study of Environmental Influences and Underlying Processes

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The Development of Intellect in Emerging Adults:

A Longitudinal Study of Environmental Influences and Underlying Processes

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Abstract

A large number of studies have been conducted on the structure of Intellect, which is one of the facets of Openness/Intellect. However, far less is known about the development of Intellect and the impact of external influences such as critical life events. In the present study, we investigated socialization and selection effects of Intellect in relation to the subjective perception of life events and self-efficacy. In a large German longitudinal sample of adolescents and emerging adults (N = 1,477), we used latent structural equation modeling across three measurement occasions to assess mean-level changes in Intellect. We found significant change in Intellect but no evidence of the influence of experiencing a critical life event. For self-efficacy, we found socialization and selection effects but no moderating role with regards to Intellect. Further research ideas are discussed.

Keywords. personality development, intellect, critical life events, self-efficacy

Introduction

Cognitive abilities and their behavioral implementations have always been a major topic as well as a compelling one for researchers. The personality trait Intellect reflects one of the foremost constructs that can be used to explore the interplay of dispositional gifts, situational properties, and the prediction of sophisticated cognitive performances. According to the Big Five personality structure, Intellect can be classified as a subdimension (or facet) of the personality factor of Openness/Intellect (DeYoung et al., 2007; Goldberg, 1992). The compound label Openness/Intellect constitutes an empirically derived dimension that displays individual differences and describes processes that reflect cognitive exploration (see DeYoung, 2014, for a review). Conceptually, Intellect is a distinct construct that encompasses attributes such as smart, clever, curious, and enjoys problem-solving and learning, and it can be considered the personality counterpart of cognitive abilities (Costa & McCrae, 1992; DeYoung et al., 2012; Goldberg, 1992; Mussel & Spengler, 2015). Whereas cognitive abilities refer to ability, which is the “can do” aspect of performance, Intellect refers to the personality trait and motivational component, namely, the “will do” or “typically do” aspect (see Mussel, 2013, for a review). For example, forasmuch as intelligence is a term that is used for an individual’s ability to acquire and then apply skills and knowledge, Intellect is the faculty of objectively understanding and reasoning about abstract matters.

Despite the differentiation between cognitive abilities and Intellect, several constructs that have been proposed from different theoretical backgrounds have been identified as distinct indicators of Intellect. These include the facets of Openness to Ideas (Costa & McCrae, 1992), need for cognition (Cacioppo et al., 1996), and epistemic curiosity (Litman & Mussel, 2013). However, constructs often overlap considerably and can all be assumed to indicate Intellect (Mussel, 2013). Others have assumed a broader conceptualization of Intellect, thereby including a "can do"-component in addition to cognitive motivation. For example, the Big Five Aspect Scale (BFAS, DeYoung et al., 2007) includes ability traits such as self-reported intelligence to measure Intellect. Hence, the debate about a shared

definition and the integration of research findings is still ongoing (e.g., Mussel, 2013; Fleischhauer et al., 2010; von Stumm et al., 2011).

In a narrower sense, we focus on the previously mentioned "will do" aspect, which is related to the cognitive motivation of behaviors such as problem-solving, thinking, information seeking, learning, and creativity (Mussel, 2013). Referring to these indicators, studies have shown that Intellect predicts not only academic investment and performance (Mussel et al., 2011; von Stumm et al., 2013) but also professional success and organizational outcomes (e.g., Campbell et al., 1993). Thus, people high in Intellect are likely to obtain more job knowledge (Arnone et al., 1994), seek new information, appreciate complex information (Litman & Mussel, 2013), show better coping styles when it comes to changes in the organization itself, and exhibit more creativity in team-building challenges (Mussel et al., 2011). However, compared with the large number of studies on the structure and outcomes of Intellect, far less is known about the development of Intellect across the life course and its moderating factors.

Intellect and Life Events

Research has supported the idea that personality is modifiable and can be changed due to environmental as well as internal influences (Geukes et al., 2018; Goldberg, 1992; McCrae et al., 2005; Roberts & Mroczek, 2008). Regarding the development of trait Intellect, critical life events can play an important role because they have been shown to influence personality development via an interaction between person and environment (Bleidorn et al., 2018). Life events are referred to as "transitions that mark the beginning or the end of a specific status" (Luhmann, et al., 2012, p. 594). A number of studies have demonstrated not only that certain life events can sustainably affect personality traits (socialization effect), but also, on the basis of existing personality characteristics, that specific events are more likely to be experienced than others (selection effect; Bleidorn et al., 2018; Jackson et al., 2012). Concerning assessments of critical life events, previous research has shown how important

it is to differentiate between assessments of the mere occurrence versus the subjective perception of life events (de Vries et al., 2021; Luhmann et al., 2020).

The interaction between person and environment is also decisive for the personality trait of Intellect. Particularly in adolescence and emerging adulthood, which are characterized by numerous changes and rapid developmental progress, critical life events can have a far-reaching impact (e.g., Bleidorn et al., 2018; Denissen et al., 2018; Pusch et al., 2018). Some of the most popular events that occur during emerging adulthood are moving away from home, graduating from high school, and/or starting further academic education (Arnett, 2000, 2007). Because these events are associated with mastering unknown challenges and dealing with cognitively demanding problem-solving strategies, it can be assumed that Intellect will increase during this time. This was previously found to be true for Openness/Intellect: When students were put into novel situations such as studying abroad for an extended period of time and had to adapt to an entirely new culture, their Openness/Intellect levels increased (Zimmerman & Neyer, 2013). As Intellect contains an evaluative component regarding epistemic behavior, it can be speculated that subjective perceptions of the life event with regards to valence are a crucial factor to consider regarding trait trajectories. Particularly, perceiving a critical life event as more positively, might reflect that a challenge was mastered successfully or that it resulted in personal growth or learning. This, in turn, might lead to altered appraisals of challenging situations that require thinking and learning which may ultimately be reflected in increasing levels of Intellect.

With regard to selection effects, different levels of Intellect could also influence how people process critical life events. That is, major life events might be perceived more positively when emerging adults encompass high levels of Intellect because they can rely on their intellectual skills and react to abstract matters and new situations more quickly—thus mastering external stressors more easily. Accordingly, DeYoung et al. (2012) found that Openness/Intellect was negatively related to Neuroticism and served as a protective factor against the experience of negative emotions. Therefore, individuals with low levels of Intellect may evaluate critical life events more negatively because of

insecurities and possible ambiguity experienced during the event. Likewise, adversely experienced life events could lead to a further decrease in Intellect. Accordingly, a decline of Openness/Intellect was previously found after experiencing critical life events such as job loss, separation, or divorce (Loeckenhoff et al., 2009).

Taken together, research has emphasized that Openness/Intellect can and does change throughout the lifespan due to external and internal influences, and there is evidence to suggest the same on the facet level for Intellect. Nevertheless, the latter has undergone far less investigation, and even less research has been conducted to assess the underlying processes that determine the development of Intellect.

The Moderating Role of Self-Efficacy

With respect to the interdependencies of environmental influences and the development of Intellect, the current study was further aimed at investigating individual differences in the processing of critical life events in relation to Intellect. A construct that is strongly related to the appraisal of life events are core beliefs, which are described as mental representations that individuals hold about themselves, others, and the world in general (Dweck, 2017). Self-efficacy constitutes such an individual framework of core beliefs and describes a person's expectation that they will be able to successfully perform desired actions on the basis of their own competencies and sustain or regulate cognitive, motivational, and affective processes (Bandura, 1997).

Self-efficacy beliefs have been shown to influence subjective well-being as well as health across different samples and cultures (e.g., Bandura 1997; Benight & Bandura, 2004; Luszczynska et al., 2009). People who believe they can count on their abilities to exercise control over events tend to deal more effectively with potential stressors, adapt more easily to ambiguous situations, and manage the demands of everyday life with less distress (Bandura 1997; Luszczynska et al., 2009). Moreover, self-efficacy is not a static construct but is rather a characteristic that can be changed through behavior,

by the external environment, or by internal personal factors, such as cognitive, affective, and biological events (Bandura, 1997).

Regarding critical life events, self-efficacy has been found to play an important role in terms of processing and coping. For example, self-efficacy mediated people's cognitive responses to stressful life events such as earthquakes (Laks et al., 2013) or general traumatic experiences (Cieslak et al., 2008) and acted as a buffer against possible long-term consequences such as numbing, flashbacks, and fatigue (Benight & Bandura, 2004; Luszczynska et al., 2009) while promoting coping strategies like seeking social support and renegotiating the self (Laks et al., 2013). In other words, even though critical life events can interfere with the current stabilization of the self-system, individuals can play a proactive role in the adjustment process, and there is evidence that people high on self-efficacy tend to subjectively perceive difficulties and obstacles with less apprehension.

With this in mind, we argue that self-efficacy should function as a moderator of the relationship between the development of Intellect and the perception of life events. As mentioned before, high levels of self-efficacy have the potential to buffer the perception of a particular life event as highly negative, for example, feeling that one has control over a situation instead of experiencing insecurity. Thus, emerging adults high in self-efficacy might be able to deal with self-defining critical life events with less struggle and adjust to new circumstances more easily. We posit that this feeling of capability will then also influence the development of Intellect. Thus, people's levels of Intellect might increase (decline) after they experience a positively (negatively) perceived life event due to high (low) levels of self-efficacy.

The Present Study

The present study aimed to investigate the development of trait Intellect in adolescence and emerging adulthood over three measurement occasions with regard to the influence of the perception of critical life events and underlying beliefs such as self-efficacy. Whereas previous studies on personality development have mainly been based on the broad concept of the Big Five, the present

study expands knowledge on normative changes in personality on a facet level and by considering environmental influences. Hereby, our focus on the facet level enables a more granular investigation of specific hypotheses about triggers and external influences on the development of Intellect over time.

First, we investigated mean differences in Intellect and assumed that the personality trait Intellect would increase during adolescence and emerging adulthood due to engagement in developmental tasks which require attributes such as thinking, learning, problem-solving, and understanding abstract matters.

Second, regarding socialization effects, we propose that life events influence the development of Intellect such that subjectively positively experienced critical life events should lead to an increase in Intellect. In this study, we focused on adolescents and emerging adults, who are in a stage in which they experience learning every day. When successfully applying cognitively demanding problem-solving strategies and, thus, perceive situations like graduating high school or moving away from home positively, emerging adults might seek out further developmental tasks to master– resulting in a further increase in Intellect. In turn, we propose that people with different levels of Intellect vary in their perceptions of critical life events. According to the niche principle, people create social environments and paths in their lives that help them maintain their current trait levels (Roberts & Nickel, 2017). Hence, people select themselves into niches that match their personality and search for environments which correspond to their behavior and experience (Jackson et al., 2012; Roberts & Nickel, 2017). For example, with regard to problem solving, people high in Intellect should experience more control in adverse situations, and this experience of control should result in an overall more positive evaluation of a critical life event. By contrast, low scores in Intellect should lead to a more negative experience because, for example, when individuals lack the ability to understand abstract matters, they might feel insecure and possibly ambiguous during the event.

Third, we extended our theoretical approach by investigating if certain associations are different for different people and examine whether self-efficacy moderates the relationship between Intellect

and the perception of life events. In particular, we analyzed whether perceived confidence in one's own effectiveness of action functions as the key variable between the mastering of critical life events and the development of Intellect. Altogether, we investigated the development of Intellect in relation to the subjective perception of life events and the influence of self-efficacy.

Method

Sample and Procedure

The current study used data from the GePP (Mussel, 2021) which is a longitudinal panel that we created by collecting data from a large German sample in cooperation with a German company that provides a nonprofit online career counseling test (*berufsprofiling.de*). On this test, participants are asked questions about their personality traits and vocational interests. Afterwards, they receive comprehensive feedback and advice about job opportunities and academic pathways after graduation.

The counseling test took place in the years 2016 and 2017, and we refer to this as T1 of GePP (Mussel, 2021). At the end of this test, emerging adults were asked if they want to participate voluntary in a longitudinal research study. If participants agreed to be contacted again, they were reached out for via e-mail approximately one year later in September 2018 (measurement occasion T2) and in October 2019 (measurement occasion T3). Starting from T2, we included the variables of interest (perception of life events and self-efficacy) which are used in the present study. Participants took an online test lasting approximately 35 min and received financial compensation (EUR 5,-), and personal feedback on their results.

Sample. A total of N = 1,526 individuals between 14 and 26 years of age (M = 17.39, SD = 2.37, 64.82% female) agreed to participate at T2 and filled out the online questionnaire. At T3, N = 1,089 (69.62% female) participated in the study, out of whom N = 804 had also participated at T2. We did not include participants who were older than 21 years at the T1 of GePP (Mussel, 2021) because we were interested in adolescents and emerging adults who were about to, for example, graduate from school and thus find themselves in a critical life period over the following measurement occasions.

Accordingly, at the third measurement occasion (T3), 4% had not yet finished high school, 21% held a secondary school certificate, and a majority of 75% held a university entrance diploma. Out of these participants, 45% had already entered a university, whereas only 32% were in a working position or had entered a traineeship.

Measures

Intellect. The Work-Related Curiosity Scale (WORCS; Mussel et al., 2012) was applied at T1, T2 and T3, respectively. WORCS has been found to be highly correlated with Intellect in previous studies (e.g., r = .87; Mussel, 2013) and thus serves as a valid indicator (Mussel, 2013; Mussel et al., 2012). The WORCS is a 10-item measure, and responses are given on a 7-point Likert scale ranging from 1 (*does not apply at all*) to 4 (*partly applies*) to 7 (*fully applies*). Some of the items use a frame-of-reference approach with work-related item content. An example item is ‘‘I carry on seeking information until I am able to understand complex issues’’. At T1, T2, and T3 the scale had a reliability coefficient ω between .86 and .89 (α= .84 – .87).

Life Events. The perception of critical life events was assessed at two measurement occasions, T2 and T3. On both measurement occasions, participants stated (1) which kind of event was experienced and (2) how they subjectively perceived the critical life event. However, the choice of life events slightly differed across measurement occasions.

At T2, we asked about two decisive major life events that are characteristic of the critical period between the late teens and young adulthood: graduating from school and moving away from home (Arnett, 2000; Bleidorn, 2012; Luedtke et al., 2011). Both events represent personal developmental milestones for the transition into adulthood and are typically associated with great educational/occupational challenges that imply searching for information, thinking, learning, and creativity, all of which are attributes that are strongly associated with Intellect. Moreover, e.g., in case emerging adults did not (yet) experience either of the events, we provided an open text field in which participants could individually state a decisive critical life event that had occurred in the last year. For

both cases, we assessed subjective perception through ratings that were given on a 7-point scale ranging from 1 (*very negatively*) to 7 (*very positively*).

At T3, we slightly changed our operationalization due to improved knowledge about the assessment of life events (e.g., see Luhmann et al., 2020). Again, participants stated whether they had experienced a critical life event during the last year (between T2 and T3), but this time individuals could categorize the event using one of nine categories and subsequently rate the valence of the major life event on two items ("The event was positive" and "The event was negative"). Hence, participants could select and evaluate a broader variety of life events, but we used only the information about the valence. A 7-point scale ranging from 1 (*does not apply at all*) to 7 (*fully applies*) was provided.

Self-Efficacy. To assess self-efficacy, we used the General Self-Efficacy Scale (GSE), a 10-item measure by Schwarzer and Jerusalem (1995). Responses are given on a 7-point scale ranging from 1 (*does not apply at all*) to 7 (*fully applies*). An example item is "I am confident that I could deal efficiently with unexpected events". The test was administered at T2. The GSE was found to be highly reliable ($\alpha = .83$, $\omega = .85$). All descriptive statistics and correlations can be found in Table 1.

Table 1.

Correlations and descriptive statistics among variables

				Correlations					
Variables	*N*	*M*	*SD*	1	2	3	4	5	6
1. Int-T1	1477	4.50	.94						
2. Int-T2	1477	4.98	.80	.56***					
3. Int-T3	1477	4.93	.84	.50***	.73***				
4. SE-T2	1209	4.62	.82	.31***	.49***	.39***			
5. CLE-T2	719	2.67	1.77	-.02	-.01	-.07	.07		
6. CLE-T3	951	5.57	1.88	.02	-.02	.01	.02	.05	.03

Note. N = sample size; M = mean; SD = standard deviation; Int-T1/2/3 = Intellect at measurement occasion T1, T2, and T3; SE-T2 = self-efficacy at measurement occasion T2; CLE-T2/3 = perception of the critical life events at T2 and T3

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

Statistical Analyses

All statistical analyses were carried out in R 1.2.1335 (R Core Team, 2018). We conducted our analyses in three consecutive steps. To confirm that the Intellect ratings were equivalent across time points, we tested for measurement invariance. Next, on the basis of the invariance models, we constructed latent measurement difference score models to test for mean differences in Intellect and the influence of the perception of critical life events. The main analyses were conducted using a latent change score model (Newsom, 2017). Further, as depicted in the schematic Figure 1, we added self-efficacy as a latent variable to the difference score model (dotted grey line). Finally, to test our hypothesis, we added self-efficacy to the model as a moderator (grey line).

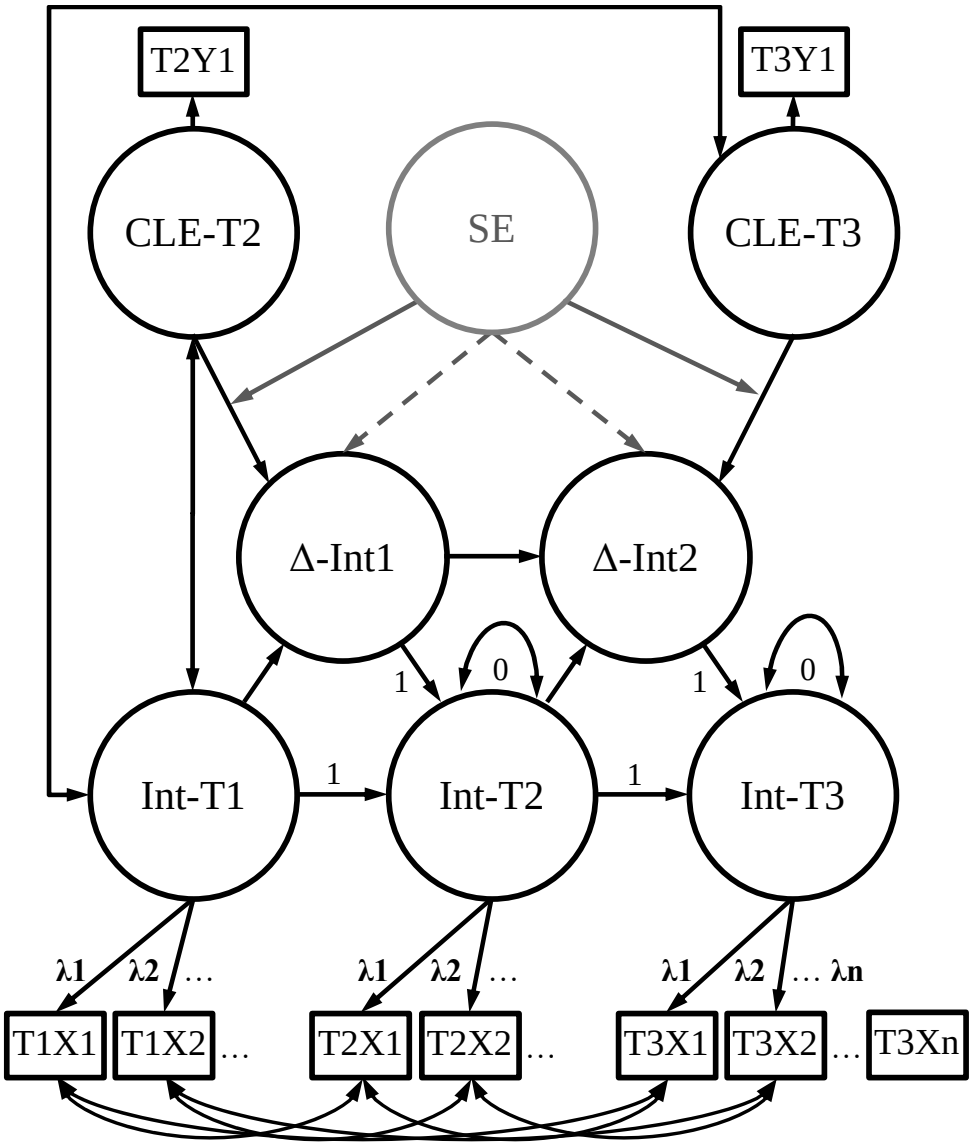

Figure 1. Schematic model of the multiple-indicator latent change score model for the influence of the perception of critical life event. The lower part represents the measurement model for Intellect (Int) and the upper part for the critical life events (CLE). Straight arrows show loadings and regression coefficients, two-sided arrows co-variances. The latent construct of Intellect was measured at three time points (T1, T2, and T3), using 10 indicators each time. T1Xn refers to the last, for example, the 10th item from the Intellect scale assessed at T1. The latent variables for the perception of critical life events CLE-T2 and CLE-T3 are indicated by single manifest variables (T2Y1 and T3Y1). Δ captures change from Time 1 to Time 2 or Time 2 to Time 3. The latent regression from CLE-T2 to Δ-Int1 (CLE-T3 to Δ-Int2) reflects the influence of the perception of the critical life event on change in Intellect. Latent regressions from Intellect at Time 1 (Int-T1) on CLE-T2 (T3) reflect the influence of the perception of a critical life event on initial levels of Intellect at the first measurement occasion. The latent regressions from SE on CLE-T2 (CLE-T3) → Δ-Int1 (Δ-Int2) indicate the influence of the moderator on the relationship between the perception of a critical life event and change in Intellect (grey line). Regressions from SE → Δ-Int1 (Δ-Int2) reflect the influence of the Self-Efficacy on latent change in Intellect (dotted grey line).

Raw Data Inspection. To improve data quality, we asked for self-reported diligence at the end of the survey at T2 and T3 (“Did you work conscientiously on the test?"). Participants were informed that their answer had no impact on their financial compensation. A total of 41 (3%) participants at T2 and 27 (2.5%) at T3 answered "No". These participants were excluded. Moreover, we checked for missing values and outliers. Further, we excluded participants who had not participated on at least two measurement points. In total, a sample of 1,477 individuals remained for the statistical analyses.

Statistical Analyses and Measurement Invariance Testing. To test for measurement invariance, progressively more constrained models are compared with each other (Vandenberg & Lance, 2000). When results showed no statistically significant difference in fit, the more constrained model was accepted (McArdle, 2009). We inspected the comparative fit index (CFI), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), and the goodness of fit index (GFI). First, we tested for configural invariance by assessing the model fit of the baseline model in which the factor loadings and intercepts were freely estimated. This model was then compared with the metric invariance model, where we fixed the factor loadings for each indicator to be equal across measurement occasions. For strong invariance, the intercepts of the manifest variables were constrained to be equal across time (Newsom, 2017). To identify the model, the mean of the latent variable Δ-Intellect at T1 was fixed to zero.

To test for changes in Intellect over time, we applied structural equation modeling and built a multiple indicator latent change score model (Kievit et al., 2017; McArdle, 2009). As depicted in the lower part of the schematic model (Figure 1), the 10 items from the WORCS served as indicators of the latent construct of interest at T1, T2, and T3. All measurement residuals were allowed to correlate across the sets of repeated measurements. The regression weight of latent Intellect at Time 2 (Int-T2) on latent Intellect at T1 (Int-T1) was fixed to one. The same was done for latent Intellect on Time 2 to Time 3 (Int-T2 → Int-T3). Additionally, the intercept and residual variance for latent Intellect at T2 and T3 were fixed to zero. As we were interested in the rate of change in Intellect over time, we added

the latent variable delta (Δ-Int1 and Δ-Int2). The loadings of latent Δ-Int1 (Δ-Int2) on latent Int-T1 (Int-T2) were fixed to 1. The regression weights of Int-T1 (Int-T2) on Δ-Int1 (Δ-Int2) were freely estimated.

The indicator variables T2Y1 (for CLE-T2) and T3Y1 (for CLE-T3) dimensionally coded how negatively/positively the stated life event was perceived. Both measures were standardized prior to being included in the model. As depicted in Figure 1, these items were included as two single-indicator latent variables (one from T1 to T2 and another from T2 to T3) into the model, and the latent change scores, Δ-Int1 and Δ-Int2, were regressed on them. Their error variance was set to .20, which equals an estimated reliability of .80 (Schumacker & Lomax, 2004). Intellect at T1 and perception of the critical life event at T2 and T3 were allowed to correlate (as shown in Figure 1 by the arrow with two heads), indicating a baseline relation between Intellect and the perception of critical life events. Here, positive correlations can be interpreted in terms of selection effects. Regarding the change in Intellect due to environmental influences (socialization effects), latent regressions from the perceptions of CLE-T2 and -T3 on Δ-Int1 and Δ-Int2 were included into the model.

Next, we investigated the role of self-efficacy. First, we added self-efficacy as a latent variable to the difference score model and regressed changes in Intellect on self-efficacy. This allowed us to exploratorily investigate the effect of self-efficacy on Intellect before investigating its moderating effect. In a final step, self-efficacy was added to the model as a moderating variable. To do so, two interaction terms between the perception of critical life events and self-efficacy were built separately (one for CLE-T2 and another for CLE-T3). Both terms were standardized prior to being included in the model, and their error variance was set to .20 (Schumacker & Lomax, 2004). As shown in Figure 1, the two latent change factors were then regressed on the single-indicator moderator variable (SE).

To account for missing data, we used Full Information Maximum Likelihood (FIML). Under the assumption of multivariate normality, FIML maximizes the utility of all existing data, decreases

bias, and increases statistical power compared with omitting incomplete cases (i.e., complete case analysis; Baraldi & Enders, 2010; Kievit et al. 2017)

Results

Measurement Equivalence

To compare differences in model fit, we applied χ^2 difference tests. Results showed no statistically significant difference in fit between the models with configural and weak invariance (χ^2 = 14.44, *df* = 18, *p* = .69) whereas a significantly worse fit was obtained when the model with weak invariance was compared with the model with strong invariance (χ^2 = 764.13, *df* = 28, *p* < .001). However, in large samples, even minor differences between measurement occasions lead to statistically significant differences in the χ^2 fit statistic (MacCallum et al., 2006). To allow a more holistic assessment, we relied on multiple types of fit indices, all of which were sufficient (all CFIs > .92, GFIs > .98, RMSEAs < .04, SRMRs < .05) for comparing means and covariances across measurement occasions (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). Therefore, strong measurement invariance was accepted for the Intellect measure, and all further analyses were based on this model. The results of the measurement invariance testing are presented in Table 2.

Table 2.
Fit indices for measurement models with increasing degrees of invariance across time, N = 1,477

Model	$\chi 2$ (*df*)	*p*($\chi 2$)	CFI	GFI	RMSEA	RMSEA 90% CI	SRMR
Model 1: Configural invariance	1150(372)	<.001	.93	.98	.04	[.04 –.04]	.04
Model 2: Metric invariance	1171(390)	<.001	.93	.98	.04	[.04–.04]	.04
Model 3: Strong invariance	1416(408)	<.001	.92	.98	.04	[.04–.05]	.05

Note. X^2 = chi-square difference statistic; Df = degrees of freedom; CFI = comparative fit index; GFI = goodness of fit index; RMSEA = root mean square error of approximation; RMSEA 90% CI = 90% confidence interval of RMSEA; SRMR = standardized root mean square residual.

Hypotheses Testing

The univariate change score model Intellect revealed a close fit (χ^2 = 1673, *df* = 492, CFI = .92, RMSEA = .04, SRMR = .05). On average, Intellect increased significantly from Time 1 to Time 2 (standardized mean of Δ-Int1: .58, $p \leq .001$) but barely changed between Time 2 to Time 3 (standardized mean of Δ-Int2: .02, $p = .51$). Furthermore, change in trait Intellect from Time 1 to Time 2 predicted changes from Time 2 to Time 3 (Δ-Int1→2, latent $\lambda = -.25$, $p = .02$).

To account for the perception of critical life events, we included the single-indicator latent variables CLE-T2 and CLE-T3 and regressed the latent change scores Δ-Int1 and Δ-Int2 on them. The regressions from Δ-Int1 on CLE-T2 (standardized estimate $\lambda = -.03$, $p = .67$) and Δ-Int2 on CLE-T3 (standardized estimate $\lambda = .02$, $p = .42$) were not significant. Thus, experiencing the stated critical life events, either positively or negatively, did not influence change in Intellect. Also, latent Intellect at T1 and CLE-T2 (standardized estimate $\lambda = -.03$, $p = .15$), as well as latent Intellect at T2 and CLE-T3 (standardized estimate $\lambda = .01$, $p = .35$) were not significantly correlated. Thus, critical life events were

not experienced differently for individuals with high compared to low levels on the measurement occasion T1.

Next, we investigated the influence of self-efficacy on latent change in Intellect. We added the latent variable self-efficacy (SE) in consecutive steps to the model. First, building upon the univariate change score model for Intellect, latent change scores Δ-Int1 and Δ-Int2 were regressed on SE. Thus, we exploratory tested for a main effect of self-efficacy on change in Intellect. The latent regression of Δ-Int1 on SE was significant (standardized $\lambda = .43$, $p < .001$), indicating that higher levels on self-efficacy were associated with a change in Intellect between T1 and T2. For the latent regression of Δ-Int2 on SE no significant effect was found (standardized $\lambda = -.02$, $p = .65$). Moreover, latent Intellect at T1 (Int-T1) and latent self-efficacy (SE) were significantly correlated (standardized $\lambda = .37$, $p < .001$). Hence, our results suggest that individuals with higher levels of self-efficacy were more likely to have higher initial levels of trait Intellect.

Second, we investigated whether self-efficacy would moderate the influence of the perception of critical life events on changes in Intellect. To do so, we built an interaction term between self-efficacy and the perception of a critical life event (one for CLE-T2 and another for CLE-T3). We included both as single-indicator latent variables in the univariate change score model for Intellect. The model fit the data well ($\chi^2 = 1738$, $df = 548$, CFI = .91, RMSEA = .04, SRMR = .05). The model showed significant improvement in fit ($\Delta\chi^2$diff = 74, $df = 56$, $p = .04$), but both regressions were not significant (Mod1: $\lambda = .05$, $p = .23$; and Mod2: $\lambda = .02$, $p = .54$). Thus, our findings provided no support for a moderating role of self-efficacy. All fit indices and parameter estimates are shown in Table 3.

Table 3.
Model fit parameters and estimates for the latent regressions and covariance for the latent change score model (see Figure 1), N = 1,477

	χ2(df)	CFI	RMSEA	RMSEA 90% CI	SRMR	ΔInt1	ΔInt2	CLET2 →ΔInt1	CLET3 →ΔInt2		
H1/ H2	1673 (492)	.92	.04	[.04 –.04]	.05	.58***	.12	-.03	.02		
								SE→ Δ-Int1	SE→ Δ-Int2	Mod→ Δ-Int1	Mod→ Δ-Int2
H3	1738 (548)	.91	.03	[.03 –.04]	.05	.58***	.12	.42***	-.02	.05	.02

Note. X^2 = chi-square value; Df = degrees of freedom; CFI = comparative fit index, should be above .90; RMSEA = root mean square error of approximation, should be below .08; RMSEA 90% CI = 90% confidence interval of RMSEA; SRMR = standardized root mean square residual, should be below .05; Δ-Int1/2 = latent change in Intellect from T1 (T2) to T2 (T3); CLE-T2/3 → Δ-Int1/2 = latent regression coefficient for latent critical life event to change in Intellect from T1 to T2 and T2 to T3; SE → Δ-Int1/2 = latent regression coefficient of self-efficacy on change in Intellect; Mod → Δ-Int1/2 = latent regression coefficient of the moderator self-efficacy on the influence of critical life events on the development in Intellect at Time 2 and Time 3.
*p < .05. **p < .01. ***p < .001.

Discussion

The present study aimed at investigating the development of trait Intellect in emerging adulthood. Taking into account environmental influences, we examined the impact of critical life events on Intellect over a time period of three years. Moreover, we tested for a moderating effect of self-efficacy and, thus, asked whether the perceived confidence in one's own effectiveness of action moderates an individual's adaption and perception of life events and thus effects the development of trait Intellect.

In a large longitudinal sample, we found that mean levels of trait Intellect changed during emerging adulthood. Our findings suggest that Intellect first increased between the first and second measurement occasions in our study and then remained nearly the same between T2 and T3. This might be due to the fact that most prevalent cognitively demanding developmental tasks, such as detachment from the family and emotional independence, take place in early adolescence. Presumably, at

measurement occasion T1, participants were in their last year of school or had just graduated when they participated in the online career service. Thus, they were concerned about their future and were preparing to enter the job market, which might account for related changes in Intellect due to exploring and adapting. These findings stand in line with previous findings that most changes in Openness/Intellect over time occur when people are exposed to cognitively demanding tasks and exhibit creative thinking and exploratory behavior (Mussel & Spengler, 2015; Mussel et al., 2011). With greater age, individuals may build up more resilience so that challenges are perceived as less distressing, which in turn might require less readjustment (Asselmann et al., 2021).

Regarding the perception of critical life events, the present results did not support our hypotheses. Neither did the stated life events predicted changes in Intellect (socialization effects), nor did they affect initial levels of Intellect on the first measurement occasion. In the present study, participants could choose the event they rated on their own. Thus, we did not influence or constrain their choice of event. Therefore, participants might have selected events that are not implicitly associated with characteristics of Intellect. For example, events such as graduating from school or spending a gap year in a foreign country are highly related to adaptability and flexibility and are thereby possibly more likely to affect Intellect levels. On the other hand, events such as breaking up with a romantic partner, for example, can be perceived as critical but might not require the implementation of analytical skills. Thus, changes in Intellect might not follow from all kinds of major life events. Moreover, change in Intellect might not be affected by only a single critical event but might instead emerge through the sum of many environmental influences and cognitively demanding tasks that are representative for the expression of Intellect. Hence, assessing multiple major life events at once, for example, might be a fruitful way to study the development of Intellect. Either way, more research needs to be conducted to figure out how the occurrence and perception of life events is best assessed and operationalized.

With regard to self-efficacy, our results suggest two interesting aspects. First, we found a socialization effect of self-efficacy on changes in trait Intellect, and second, our results suggest that the initial level of self-efficacy is related to initial levels of Intellect. Both processes have one particular aspect in common: an individual's assumption about the capability of the self. People high in Intellect like problem solving and learning new skills that help them master previously unknown challenges, whereas people high in self-efficacy are convinced of their ability to succeed at such challenges. Our results appear to indicate an inherent interrelationship from the start. Not only did we find that self-efficacy encourages the extension of characteristics that Intellect facilitates, but people high in Intellect are also more likely to show higher levels of self-efficacy. Especially in academic settings, a connection appears most prevalent. For example, previous research has suggested that Openness/Intellect and self-efficacy both serve as antecedents of study engagement (Sánchez-Cardona et al., 2012), academic achievement (Caprara et al., 2011), teaching success, and the maintenance of interest in the profession of teaching (Colson et al., 2017). As an advantage of our study, we were able to demonstrate that a content overlap might be built more precisely on the notion of the facet level of Openness/Intellect. Presumably, individuals with high levels on Intellect and self-efficacy match themselves into environments that offer a good match, where they can pursue their interests and foster new skills. It is important to note that these effects emerged from exploratory analyses. In case that these effects are replicated in future confirmatory analyses, they may provide valuable insights into the underlying mechanisms of Intellect and encourage further research regarding self-efficacy.

However, self-efficacy did not function as a moderator of the perception of critical life events and change in Intellect during emerging adulthood. We proposed an innovative approach that seemed promising in many ways. As stated earlier, encountering a critical life event can be a disturbing experience, which often requires the reorganization and reinterpretation of life in many contexts—indicators that trait Intellect facilitates. Therefore, further research should shed light on the conceptional mutual overlap of these constructs and expand the present findings by considering

different life events, personality traits, and age groups. For example, research on mid-life personality development indicates how diverse individuals deal with prospective situations (e.g., transition into parenthood) in terms of believing in innate abilities and overcoming obstacles. For instance, especially Openness/Intellect and Extraversion have been shown to predict whether people will have children or not (Jokela et al., 2011; van Scheppingen et al., 2016). Furthermore, concerning the perception of life events in mid-life, Sutin et al. (2010) found that people with high levels of Extraversion more often perceived a stressful life event as a "lesson learned," whereas Neuroticism prospectively predicted that the event would be perceived as a "turning point." Here, self-efficacy might not only determine the perception that one can successfully face a critical life event but might also contribute to selection effects and explain psychological growth in parenting. Thus, assessing different traits and age stages that go along with a greater variety of potential experiences of life events could be an interesting approach by which to further explore the impact of self-efficacy and its influence on how critical life events are understood and integrated into ongoing life.

Strengths, Limitations, and Future Directions

One of the strengths of the current study is the large longitudinal sample we collected across three measurement occasions of emerging adults from all over Germany. We used advanced statistical techniques, such as latent change score modeling, to assess mean-level changes and moderating effects. However, there might be some self-selection effects in the sample because participants voluntarily chose to take part in a counseling test that was given to help students explore occupational opportunities after graduation. Thus, there might be preexisting differences because only emerging adults who were concerned about their future might have taken the test in the first place. Moreover, change in Intellect should be differentiated between different cultural groups. Developmental transitions and environmental demands can be perceived very differently from individuals with distinct cultural backgrounds and more diverse samples are needed.

With regard to the assessment of critical life events, we considered the latest research in the field and followed a dimensional approach for examining the perception of critical life events (Luhmann et al., 2020). Nevertheless, the operationalization must be considered in the light of some limitations because we assessed life events at only two occasions (i.e., T2 and T3). Participants were able to indicate only whether they had experienced a critical life event during the last year. Therefore, we had no information about whether the event had occurred 2 weeks ago or 11 months ago, which may also have affected the person's perception of the event.

Finally, caution should be taken when comparing our findings with other studies that have investigated the personality trait of Intellect. As stated earlier, the construct of Intellect is often defined and assessed in different ways. In the present study, we relied on a definition of Intellect which focusses on the aspect of epistemic curiosity, which was implemented by the Work-Related Curiosity Scale (Mussel et al., 2012). Here, components of Intellect are, for example, information gathering ("I am eager to learn"), cognitive motivation ("I enjoy pondering and thinking"), and creativity ("I try to improve work processes by making innovative suggestions"). However, other measures can capture broader or narrower aspects of Intellect, which could limit our study's comparability to other studies because observed effects might stem from differences in construct coverage.

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Chapter 4

Trajectories in Life Satisfaction Before and During COVID-19 With Respect to Perceived Valence and Self-Efficacy

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Trajectories in Life Satisfaction Before and During COVID-19 With Respect to Perceived Valence and Self-Efficacy

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Abstract

Actions taken by governments to counteract the spread of the COVID-19 pandemic led to profound restrictions in daily lives, especially for emerging adults, with closed schools and universities, travel restrictions, and reduction in social contacts. The current study is one of the first to investigate the development of life satisfaction with assessments before and during the pandemic, including separate measurement occasions during a strict lockdown and when the implemented restrictions were relaxed again. First, we investigate the outbreak of the COVID-19 pandemic with respect to its perception as a critical life event. Further, we examine the influence of self-efficacy on change in life-satisfaction, as the belief in one's innate abilities has been shown to promote health related behavior and buffers against effects of negatively perceived critical life events. Data are based on the German Personality Panel (GePP) with 1,920 emerging adults, assessed on four measurement occasions over a period of three years. While average life satisfaction remained stable across time, we found a main effect of perceived positive valence and self-efficacy on latent change in life satisfaction at the within person level. Expressions of self-efficacy did not moderate the influence of the perception of the pandemic on self-reported life satisfaction. This study provides an important contribution to the recent COVID-19 literature as well as to the debate on stability and change of self-reported life satisfaction.

Keywords. covid-19, life satisfaction, critical life events, self-efficacy, set point theory

Introduction

With the outbreak of the new strain of the coronavirus (COVID-19), the severe measures to counter the spread of the virus led to unprecedented changes in the daily life of people all around the world. In Germany, from March 2020 onwards, schools and universities were closed, travel restrictions were imposed, and general mobility was restricted, social interactions were limited to the bare necessity, and health regulations such as wearing masks as well as social distancing rules were established. Declared as a global pandemic by the World Health Organization (WHO), the corona crisis constitutes a collectively experienced environmental impact that displays a severe, large-scale impact on the population in various aspects. The corona pandemic can be interpreted as a collective life event: It leads to struggles that affect many if not most people and demands major adjustments and adaptive behavior (Wundrack et al., 2021). Moreover, critical life events are often defined as transitions that mark the beginning or the end of a specific status (Luhmann et al., 2012). Importantly, events can be perceived very differently (Luhmann et al., 2020) and it has been argued that it is the perception of a specific event and its interpretation that makes it a *critical life event*, as opposed to its "objective nature". The COVID-19 pandemic represents such an event which is often experienced very differently. Further, it has been argued that the corona measures have a huge impact on psychological well-being, such as life satisfaction. Self-reported life satisfaction reflects individual's evaluation of one's own life circumstances and displays an overall assessment of feeling and attitudes about one's life. Life satisfaction has been shown to decline due to the COVID-19 measures (e.g., Ammar et al., 2020; Arslan & Leung, 2021; Gawrych et al., 2021; Kimhi et al., 2020; Meyer, et al., 2021; Zacher & Rudolph, 2021) but longitudinal investigations with assessments before the beginning of the corona-pandemic are still rare. Importantly, it could be the case that reported short-term changes in life satisfaction or retrospective reports of life satisfaction before the pandemic are biased (Buecker & Horstmann, 2021). The current study aims at addressing this gap by providing results from a longitudinal study with assessments before and during the pandemic, including separate measurement

occasions during a strict lockdown and when the implemented restrictions were eased again. Moreover, we focus on variables that are theoretically relevant for inter-individual differences in trajectories in life satisfaction. Here, we especially highlight the potentially moderating role of self-efficacy. The personality trait self-efficacy has been increasingly under investigation with regard to the processing of critical life events and might influence how individuals deal with the implementations of the pandemic.

The Impact of COVID-19 Measures on Emerging Adults

With respect to their social consequences, the anti-corona measures pose a strong challenge for emerging adults. Emerging adults find themselves in a period of forming their personal identity and mastering developmental milestones such as gaining independence from parents. Restrictions due to the COVID-19 pandemic, like for example school and university closures, meant that emerging adults were forced to learn from home and adapt to online video conferencing immediately and mostly without training. Likewise, parent-adolescent relationships were influenced by the corona measures (Buelow et al., 2021).

Importantly, the consequences of such measures were stronger for some than for others (Buelow et al., 2021; Flesia et al., 2020). For example, children and adolescents with low socioeconomic status, low parental education and migrant status were particularly burdened by the effects of the COVID-19 pandemic (e.g., Ravens-Sieberer et al., 2021). Specifically, pre-existing inequity across families, e.g., with respect to resources for virtual learning environments, were shown to moderate the effect of anti-corona measures on learning outcomes (Buelow et al., 2021; Flynn et al., 2021; Fontenelle-Tereshchuk, 2021; La Rosa & Commodari, 2021). In the long run, this will mean that later higher education and consequently the future of emerging adults might be affected (Engzell et al., 2021).

Along with stay-at-home orders during COVID-19, some emerging adults may have been increasingly exposed to abuse and neglection. Recent research suggests that due to the circumstances of the pandemic, general vulnerability in children and young adults increased while stressors in

(working) parents and caregivers also increased–whereas a reduction of normal protective services was noted (Fosco et al., 2021; Ravens-Sieberer et al., 2021; Tso et al., 2020).

Regarding social contact, emerging adults depend on their worship community with nonfamily members and peer groups probably more than any other age group (Sander et al., 2017). With cancelled events like graduations and proms, important critical life events may have been missed. Moreover, clubs and bars were closed and meeting with friends was nearly impossible. Accordingly, the feeling of loneliness increased, and the quality of social relationships was perceived worse during the pandemic than before (Buecker & Horstmann, 2021). Together, emerging adults' social, emotional, and mental well-being may have been burdened by the corona pandemic in various aspects and as a consequence, implementations in daily life might also have interfered with emerging adults' perceived overall life satisfaction.

Importantly, recent research concerning the perception of critical life events such as the corona pandemic, has shown that subjective perceptions of life events can better explain the consequences of the life event compared to an objective assessment of the life event alone. For example, introverted emerging adults might have encountered the restriction of social contact less decisive than extroverted adolescents, who were formerly meeting up with their peers on a daily basis. This differentiation has often been neglected in previous research, for example, when investigating related personality change and entering work life /retirement (Asselmann & Specht, 2021), parenthood and paid employment (Denissen et al., 2019) or life events such as beginning a relationship and studying in university (Leikas & Salmela-Aro, 2015). However, there is ample evidence that life events are perceived quite differently because they interact with, for example, preexisting characteristics and attitudes of a person, and thus evoke differences in related personality change (Bleidorn et al., 2020; de Vries et al., 2021; Haehner et al., 2021; Luhmann et al., 2020; Rakhshani et al., 2021). Therefore, the present study aims at addressing this gap by investigating interindividual trajectories in life satisfaction with respect to the perception of the corona measures–separately assessed for perceived positive and negative valence.

Trajectories in Life Satisfaction

Self-reported life satisfaction reflects a subjective overall assessment of feelings and attitudes about one's life (Fujita & Diener, 2005). High levels of subjective life satisfaction were shown to facilitate many advantageous aspects of life such as longevity (Danner et al., 2001), marriage (Mastekaasa, 1994) and physical condition (Mroczek & Spiro, 2005). Moreover, subjective life satisfaction is often regarded as an important mental health index (Koivumaa-Honkanen et al., 2004) and, thus, is highly desirable in itself.

Several theories have been developed to explain when and why subjective life satisfaction changes or remains stable. One common approach is to try to explain trajectories in life satisfaction in connection with experiencing critical life events (e.g., Andrew et al., 2008; Fujita et al., 2005; Lucas et al., 2004). For example, according to Set Point Theory, subjective life satisfaction has a baseline for each individual and the subjective well-being fluctuates around this stable set point (Headey & Wearing, 1989; Lykken & Tellegen, 1996). After experiencing unusual or critical life events, individuals show altered levels of life satisfaction which quickly return to their set point (see Diener et al. 2006, for a review). For a long time, Set Point Theory was the most widely accepted and empirically validated theory of life satisfaction. However, recent research suggests that critical life events can influence life satisfaction lastingly and perturb individuals away from their stable set point without returning to it. For example, in a study by Headey and Muffels (2018), 14–30% of a large German panel recorded medium- and long-term changes in their set points due to various aspects such onset of a chronic health problem and long-term unemployment. Moreover, critical life events like marriage and disability (Anusic et al., 2014), unemployment (Lucas et al., 2004), or widowhood (Yap et al., 2012) seem to have a rather strong influence on long-term levels of subjective life satisfaction. Despite meaningful life events, van Praag and colleagues (2003) identified also health, family, and finances as important determinants of overall life satisfaction. Hence, external circumstances, such as living conditions, might matter more than previously expected and life satisfaction can and does change for

some people permanently (Fujita & Diener, 2005). Conjointly, possible adaptations of Set Point Theory are currently under debate because an adequate theory of subjective life satisfaction should account for all factors–for those that tend to stabilize and those that alter (Headey & Muffels, 2018).

Changes in Life Satisfaction Due to COVID-19 Measures

The COVID-19 pandemic represents not only a major medical and economic crisis, but also impacts people all around the world on a psychological dimension because of the far-reaching restrictions on daily living. Accordingly, the World Health Organization has highlighted how the pandemic can have negative consequences on psychological well-being (WHO, 2020). This stands in line with most of the recent studies which report declines in subjective well-being due to the implementation of the anti-COVID-19 measures (Ammar et al., 2020; Arslan & Leung, 2021; Gawrych et al., 2021; Kimhi et al., 2020; Meyer, et al., 2021; Zacher & Rudolph, 2021). Foremost, people displayed declines in average life satisfaction and positive affect with the onset of the restrictions, in March 2020 (Arslan & Leung, 2021, Zacher & Rudolph, 2021). Importantly, some studies isolated specific causes of declines in life satisfaction, namely reduced social participation (Ammar et al., 2020) due to forced social distancing and home confinement (Gonzalez-Bernal et al., 2021), the concern about the possible infection or dead of loved ones (Arslan & Leung, 2021), and exhaustion of employees (Meyer et al., 2021). Similar effects on self-reported life satisfaction have also been found across different cultures (Gonzalez-Bernal et al., 2021; Meyer et al., 2021; Raza et al., 2020) which underlies the relevance of the topic.

At the same time, several studies have identified external and internal resources to promote resilience with respect to a decline in life satisfaction. Among external resources such as financial independence or good health (van Praag et al., 2003), there are also internal psychological resources which might act as a buffer against distress and promote well-being. For example, high levels in self-efficacy have been shown to negatively relate with mental health problems such as depression, anxiety, and perceived helplessness. Moreover, internal control beliefs have been shown to function as an

important coping resource in the face of processing psycho-social stressors (Benight & Bandura, 2004; Luszczynska et al., 2009). Thus, self-efficacy represents a promising source to further investigate interindividual differences in life satisfaction with respect to the implications of the corona pandemic.

The Moderating Role of Self-Efficacy

Self-efficacy describes the expectation of a person to be able to successfully perform desired actions based on their own competencies and to sustain and regulate cognitive, motivational, and affective processes (Bandura, 1977). The influence of self-efficacy on health-related components (such as posttraumatic recovery) as well as subjective general well-being has been previously shown across different samples and cultures (e.g., Bandura 1977; Benight & Bandura, 2004; Luszczynska et al., 2005).

With respect to the corona pandemic, self-efficacy could thus play an important role towards the processing of a critical life event and related repercussions for subjective life satisfaction. With the onset of the COVID-19 measures, emerging adults were forced to adapt to new situations such as homeschooling, acquire knowledge about digital platforms, adjust their way of learning and manage their social life in altered ways. This rearrangement of living circumstances represents a time of great uncertainty which might evoke the feeling of loss of control and distress. One way to reduce this burden has been to believe in one's innate abilities and power of action to overcome obstacles. Accordingly, individuals with low levels in self-efficacy might experience the implications of the pandemic overwhelming and get the feeling of disappointment when, for example, they fail to adjust to new learning tools or lose their connection to peer communities. This, in turn, might echo on life satisfaction levels, as subjective life satisfaction captures a main dimension of well-being related to psychological factors. Thus, self-efficacy could act as a protective factor to the processing of the implications of the pandemic and prevent from a subjective experienced decline in life satisfaction.

Contradicting results were previously found for the stressful life event of losing a spouse. Research on this life event has demonstrated associations with long-lasting negative effects on well-

being (Anusic et al. 2014; Yap et al. 2012). Specht et al. (2010) investigated whether external locus of control, the belief that chance and powerful others control one's life, influences the coping process with the stressful life event “widowhood”. The authors found that high levels of external locus of control led to a considerably smaller decline in life satisfaction, suggesting that individuals who expect major life events to be mainly driven by external forces (by e.g., the belief in fate), might cope more effectively with such uncontrollable events because they expect their own helplessness more easily (Specht et al., 2010). Yet, with regard to the corona pandemic, in recent studies internal locus of control, which refers to the belief that the outcome of events in one’s life is contingent upon one’s actions, rather serves as a protective factor. For example, Krampe and colleagues (2021) investigated whether locus of control moderated the relationship between COVID-19 stress and general mental distress. Here, internal locus of control served as a buffer to related COVID-19 stress whereas external locus of control exacerbated this relation (Krampe et al., 2021). Likewise, a recent study by Flesia et al. (2020) identified internal locus of control along with emotional stability as protective factors against the level of perceived stress during the corona pandemic. Vice versa, external locus of control has been shown to predict higher anxiety and depression severity after experiencing negative life events (Hovenkamp-Hermelink et al., 2019).

Taken together, self-efficacy constitutes a relevant personality trait for retaining and promoting mental health which is related to controllability appraisals and active coping that might account for individual differences in life satisfaction. However, evidence on similar constructs is still inconclusive and only few studies have provided data before the pandemic to account for a comprehensive picture on the influence of the COVID-19 measures.

The Present Study

The COVID-19 measures have a far-reaching influence on the subjective well-being of emerging adults and the prolonged impact on trajectories in life satisfaction has not yet been examined sufficiently. The present study investigates the influence of the COVID-19 pandemic as a critical life

event on subjective life satisfaction. In this study, we focus on emerging adults who are particularly affected by the pandemic with restrictions in everyday life such as closed schools and universities, travel restrictions, closed nightlife, and reduction in social interactions. We propose that these restrictions lead to change in self-reported average life satisfaction. Our data give the possibility for a holistic view to investigate change in life satisfaction in a representative sample of emerging adults on four measurement occasions.

First, we investigate trajectories in life satisfaction with assessments before and during the pandemic, including separate measurement occasions during a strict lockdown and when the implemented restrictions were relaxed again. Second, we employ a dimensional approach to critical life events and argue that the perception of the corona pandemic should predict interindividual changes in subjective life satisfaction. Specifically, we expect that experiencing the corona pandemic as more negatively and less positively is related to stronger decrease in subjective life satisfaction compared to individuals who perceive the pandemic less negatively and more positively. Moreover, a possible decline in life satisfaction should be observed at the onset of the restrictions. In line with Set Point Theory, life satisfaction should then return to the original state when restrictions are lifted again.

Third, we expect that self-efficacy moderates the effect of the corona pandemic and its perception on subjective life satisfaction. Specifically, individuals high in self-efficacy should be less negatively affected by the anti-corona measures with regard to their self-reported life satisfaction. High levels of self-efficacy are thus a protective factor that could buffer the effect of the corona pandemic on subjective life satisfaction.

Method

Data and Recruiting Procedure

We used data from the GePP (Mussel, 2021), a large-scale longitudinal study, starting in 2016. We established the panel in cooperation with a German company that provides a nonprofit online career counseling test (*berufsprofiling.de*). In this test, participants are asked questions on their personality

traits as well as vocational interests. The test takes approximately 35 minutes to complete. After completing the test, participants received individualized feedback on further academic pathways.

In September 2018, we invited emerging adults who participated in the former counseling test to take part in a research panel study. We refer to this as our measurement occasion T1. If they agreed, participants were reached out for via E-Mail approximately once a year. Moreover, a financial compensation with proceeding measurement occasions worth € 5,– to € 10,– was provided. Written informed consent was obtained for all participants at all times. Ethical approval for the research project was received and data analyzed in the current study have not been analyzed or published elsewhere before. More information about GePP can be found on OSF: https://osf.io/7w9yj/.

Sample and Attrition Effects

For the present study, four measurement occasions are used from the GePP. In September 2018, 1,679 participants of the counseling test agreed to take part in the panel study from which 1,348 provided data on the variables of interest (T1). One year later, at T2, all participants of the counseling test were contacted again. From the 1,089 participants who filled out the test at T2, 804 had also participated at T1 whereas 285 participated for the first time. Data for T3 were collected between April and June 2020 from a total of 902 individuals who had also participated at T1, T2, or both. Data for T4 were obtained in November 2020 from a total of 582 individuals who had participated at T1, T2, T3 or at all of the three measurement occasions.

To check for attrition effects, we examined differences in average life satisfaction by comparing participants who continued versus dropped out on our panel study with proceeding measurement occasions. At T1, average life satisfaction of continuers (participated at T2) did not differ significantly from dropouts (did not participate at T2) (t[1271] = -1.61, p = .11). Also on T2 (t[1044] = -.32, p = .75) and T3 (t[552] = -.54, p = .59) continuers (participated at T3 [T4]) and dropouts (did not participated at T3 [T4]) did not significantly differ in their expression of subjective life satisfaction. We excluded participants who negated the diligence criterion at the end of the survey (Did you work conscientiously

on the test?") at the measurement occasions T1 and T4. Participants were informed that their answer had no impact on their financial compensation. We excluded 41 (3.0%) participants from all further analyses on T1 and 3 more participants (0.48%) on T4.

The final sample consisted of N = 1,920 participants (T1: Mage = 19.2, SDage = 2.4, range 14 – 28 years) from whom were 65% female. Regarding occupation, at T4, 17% stated to be in a working position, 15% entered a trainee ship, 13% of the participants indicated to do something else or taking a gap year and the majority of 55% were in university or conducting a dual university degree.

Measures

Life Satisfaction. Life satisfaction was assessed with the German version of the Satisfaction with Life Scale (SWLS; Glaesmer et al., 2011). The SWLS is the most commonly used measure for life satisfaction and contains 5 items (e.g., “In most ways, my life is close to ideal”). Responses are given on a 7-point rating scale ranging from "does not apply at all" (1) to "partly" (4) to "fully applies" (7). The test was applied at all measurement occasions. The SWLS is found to be highly reliable across all measurement occasions T1 – T4 (α = [.85 – .86, ω = [.85 – .87]). The development and distribution of average manifest life satisfaction can be found in Figure 1.

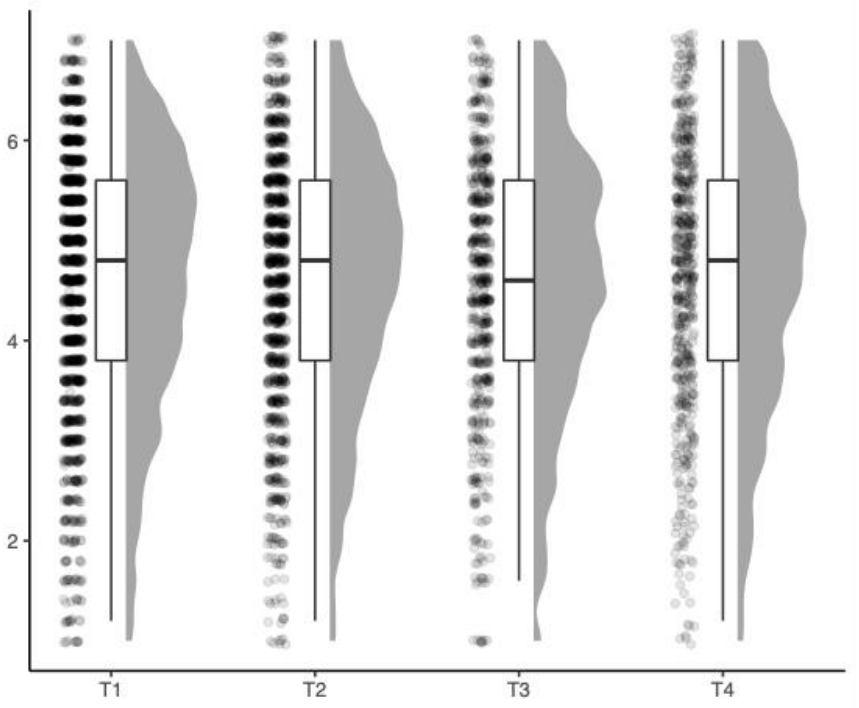

Figure 1. Boxplots of manifest average life satisfaction across four measurement occasions (T1–T4)

Self-Efficacy. To assess Self-Efficacy, we used the General Self-Efficacy Scale (GSE), a 10-item measure by Schwarzer and Jerusalem (1995). Responses are given on a 7- point rating scale ranging from "does not apply at all" (1) to "partly" (4) to "fully applies" (7). At our measurement occasion T1, the GSE is found to be highly reliable (α = .84, ω = .84).

Attitudes Concerning the Corona-Crisis. We assessed the perceived valence of the corona pandemic at two measurement occasions. For T3, data were collected at the beginning of the pandemic between March and June 2020. For T4, we collected data approximately half a year later, in November 2020. Referring to the corona crisis as a critical life event, we asked participants to rate the two valence items “The critical life event is positive” and “The critical life event is negative”. On T4, the items were slightly changed into “The corona pandemic is positive” and “The corona pandemic is negative”. For each of the items, responses are given on a 7-point rating scale ranging from "does not apply at all" (1) to "partly" (4) to "fully applies" (7). All descriptive statistics and correlations can be found in Table 1.

Table 1.
Correlations and descriptive statistics among manifest variables

				Correlations								
Variables	*N*	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. LS–T1	1,348	4.57	1.30	*.86*								
2. LS–T2	1,061	4.60	1.28	.64	*.85*							
3. LS–T3	902	4.55	1.33	.62	.73	*.87*						
4. LS–T4	582	4.65	1.35	.62	.71	.78	*.86*					
5. SE	1,486	4.63	.81	.33	.25	.27	.27	*.84*				
6. P–T3p	900	2.64	1.37	.05	-.04	.04	-.04	.03				
7. P–T3n	900	2.57	1.34	.00	-.02	.02	.02	.08	.56			
8. P–T4p	582	2.37	1.46	.03	-.04	-.07	-.02	.03	.37	.31		
9. P–T4n	582	2.45	1.45	.04	-.05	.01	.02	.02	.30	.41	.60	

Note. N = sample size; M = mean; SD = standard deviation; LST1 – LST4 = life satisfaction at measurement occasion T1, T2, T3, and T4; SE = self-efficacy at measurement occasion T1; P–p/P–n = perceived negative or positive valence of the corona pandemic at T3 and T4; Coefficient omega is presented in the diagonal.

Analyses

All statistical analyses were performed in R version 4.0.3 (R Core Team, 2019) using the packages psych (Revelle, 2017), lavaan (Rosseel, 2012), semTools (Jorgensen et al., 2020) and ggplot2 (Wickham, 2016).

Measurement Invariance Testing. Comparing means and covariances across measurement occasions requires establishing measurement invariance (Vandenberg & Lance, 2000). Thus, to confirm that life satisfaction scores observed at different measurement occasions reflect the same level of the underlying latent variable, we tested for measurement invariance across the four-wave longitudinal data. To do so, progressively more constrained models are compared to each other. We inspected the fit indices comparative fit index (CFI), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR). As thresholds, sufficient model fit was assumed when CFI values were .90 or greater and both RMSEA and SRMR values were found to be .06 or lower (Cheung & Rensvold, 2002; Hu & Bentler, 1999; Marsh, Hau, & Grayson, 2005).

First, we tested the latent construct of life satisfaction for configural invariance, allowing all factor loadings and item intercepts to vary freely across measurement occasions. This model was then compared to the metric invariance model, where we fixed the factor loadings for each indicator to be equal across measurement occasions. Finally, for strong invariance, the intercepts of the manifest variables were constrained to be equal across measurement occasions. For the present study, strong measurement is a pre-requisite to interpret latent means in life satisfaction across different measurement occasions (Newsom, 2017).

Statistical Analyses. We used a multiple indicator latent change score model to estimate change in life satisfaction over time. As shown in the schematic model in Figure 2, the 5 items from the Satisfaction With Life Scale served as manifest indicators for the latent construct and their residuals were allowed to correlate among the sets of repeated measurements.

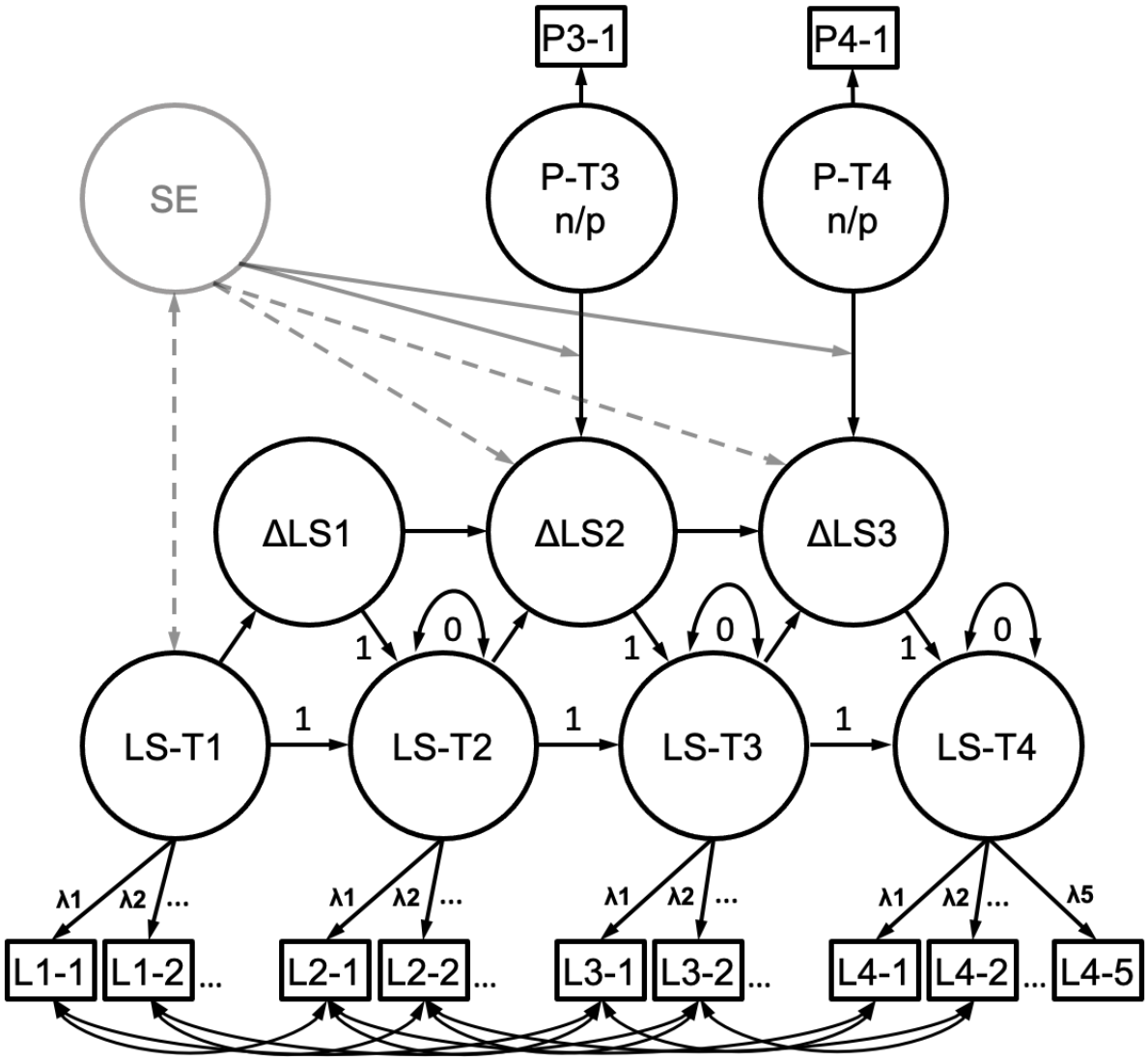

Figure 2. Schematic model of the multiple-indicator latent change score model for the influence of the perception of the corona pandemic. The lower part represents the measurement invariance model for Life Satisfaction (LS) and the upper part for the latent change in Life Satisfaction (ΔLS). Straight arrows show loadings and regression coefficients, curved arrows co-variances. The latent construct of Life Satisfaction was measured at four measurement occasions (T1, T2, T3 and T4), using five manifest indicators each time (L1–L5). The latent variables for the perception of the corona pandemic are indicated by single manifest variables (P3–1 and P4–1). The latent regressions from the perception of the critical life event (P–n/p) to ΔLS reflect the influence of the perception of the corona pandemic on latent change in Life Satisfaction on T3 and T4. SE indicates the influence of self-efficacy on change in latent Life Satisfaction (dotted line) and the moderator effect of self-efficacy on the influence of perception of the critical life event on change in latent Life Satisfaction (grey line).

The autoregressive paths between LS–T4 → LS–T3, LS–T3 → LS–T2, and LS–T2 → LS–T1 were fixed to one. To account for change across time, three latent change variables Δ*LS1*, Δ*LS2*, and Δ*LS3* were added to the model. The intercepts and variances of latent life satisfaction (except for LS–T1) were constrained to 0, whereas the latent intercepts and variances of Δ*LS1*, Δ*LS2*, and Δ*LS3* were freely estimated. Moreover, the loadings of Δ*LS3* (Δ*LS2*, Δ*LS1*) on latent life satisfaction at time LS–T4 (LS–T3, LS–T2) were fixed to 1.

Next, to account for the perception of the corona pandemic, we added a latent variable for positive and negative valence at T3 and T4. To do so, we standardized the valence-items prior to inclusion into the model and added them as single indicator latent variables. The covariates' error variance was set to .20 which equals an estimated reliability of .80 (Schumacker & Lomax, 2004). Previous studies showed that perceived valence constitutes a complex dimension, and that positive and negative affect should be interpreted distinct from each other (Dejonckheere et al., 2021; Luhmann et al., 2020; Zammitti et al. 2021). Thus, we analyzed the models separately for self-reported positive and negative perception of the corona pandemic. The change score *ΔLS2* was then regressed on the latent covariate *perception of the life event P–T3.* Analogously, the same was done for *ΔLS3* → *P–T4.*

Next, we added the variable self-efficacy to the model. We used data from trait self-efficacy at the first measurement occasion. At T1, the corona virus did not yet exist and could therefore not interfere with the self-efficacy report. To assess the influence of self-efficacy on the development of life satisfaction with respect to the corona pandemic, we regressed the latent change scores *ΔLS3* and *ΔLS4* on self-efficacy. Moreover, life satisfaction at T1 and self-efficacy were allowed to correlate (as shown in Figure 2 by the arrow with two heads), indicating a baseline relation between life satisfaction and self-efficacy.

Finally, we investigated whether self-efficacy moderated the influence of perception of the life event on changes in life satisfaction. As product indicator methods provide an accurate method to estimate and test latent interactions (Schoemann & Jorgensen, 2021), the moderators were built with

an interaction term between the standardized variable *perception of the life event* and the self-efficacy measure. The life satisfaction change factors *ΔLS3* and *ΔLS4* were then regressed on the moderator, respectively.

We accounted for missing values data by using Full Information Maximum Likelihood (FIML). Values were missing when, for examples, participants did not respond on all measurement occasions or did not finish the entire questionnaire. Under multivariate normality, FIML maximizes the utility of all existing data, decreases bias, and increases statistical power compared to omitting incomplete cases ('complete case analysis'; Baraldi & Enders, 2010; Kievit et al. 2017).

Results

The configural invariant model of life satisfaction showed good fit (χ^2 = 234, *df* = 134, CFI = .988, TLI = .983, RMSEA = .023, SRMR = .038) and the weak invariant model revealed similar fit (χ^2 = 257, *df* = 146, CFI = .987, TLI = .983, RMSEA = .023, SRMR = .043). Likewise for the strong invariant model, the data fitted the model well (χ^2 = 299, *df* = 161, CFI = .985, TLI = .982, RMSEA = .024, SRMR = .043). To account for the sensitivity of the χ^2 difference test to sample size exceeding 300, we relied on fit parameter criteria proposed by Cheung & Rensvold (2002): a comparative fit index (CFI) difference not larger than .01 across models implies that the model fit does not deteriorate considerably. Therefore, strong measurement equivalence was accepted for the life satisfaction measure (ΔCFI < .010) which allows for analyzing mean differences across measurement occasions. Therefore, all further analyses are based on this model. The results of the measurement invariance testing are depicted in Table 2.

Table 2.
Fit indices for measurement models with increasing degrees of invariance across time

Model	$\chi 2$ (*df*)	*p*($\chi 2$)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Model 1: Configural invariance	234 (134)	<.001	.988	.983	.023	[.018 – .028]	.038
Model 2: Metric invariance	257 (146)	<.001	.987	.983	.023	[.019 – .028]	.043
Model 3: Strong invariance	299 (158)	<.001	.985	.982	.024	[.020 – .028]	.043

Note. X^2 = chi-square difference statistic; Df = degrees of freedom; CFI = comparative fit index; GFI = goodness of fit index; RMSEA = root mean square error of approximation; RMSEA 90% CI = 90% confidence interval of RMSEA; SRMR = standardized root mean square residual.

Hypotheses Testing

For the development of life satisfaction, the multiple indicator latent change score model showed good model fit (χ^2 = 495, *df* = 158, CFI = .984, RMSEA = .025, SRMR = .044). Although there was a tendency in the expected direction of latent life satisfaction (Figure 3) towards a decrease on T3 – the onset of the corona measures – the effect was not significant for neither of the latent (standardized) intercepts (*ΔLS1: est* = -.02, *se* = *.04*, *p* = .51; *ΔLS2 est*= -.03, *se* = .04, *p* = .52; *ΔLS3*, *est* = .08, *se* = .05, *p* = .07*)*. Thus, and contrary to previous findings, we rejected our first hypotheses that restrictions lead to a general change in self-reported average life satisfaction.

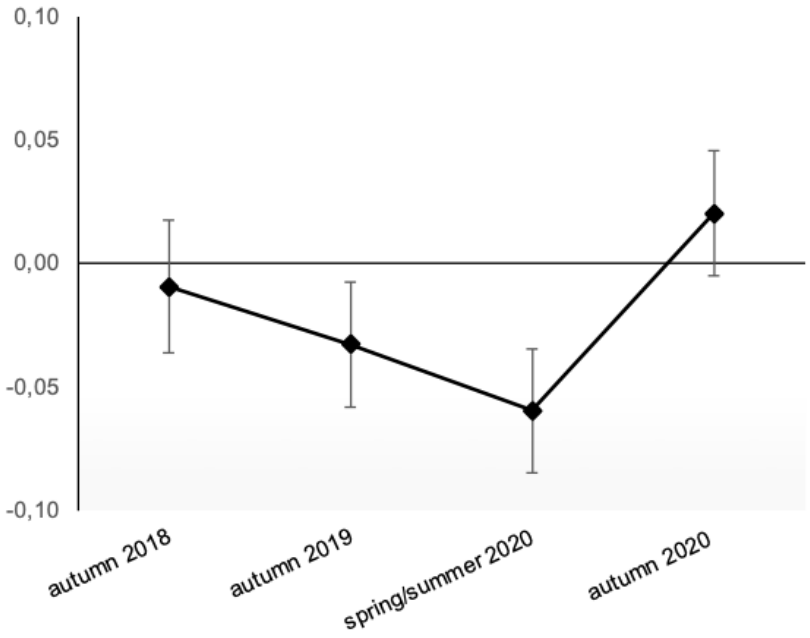

Figure 3. Standardized latent life satisfaction across four measurement occasions (T1–T4)

With respect to the second research question, our findings revealed a more nuanced picture. To test whether perceptions of the COVID-19 related restrictions predict change in life satisfaction, we separately added latent variables reflecting perceived negative and positive valence. Again, the model fitted the data well (χ^2 = 336, *df* = 194, CFI = .984, RMSEA = .023, SRMR = .043). When asking participants how positively they experienced the corona pandemic, they showed significant change in life satisfaction with the onset of the corona measures at T3 (*est* = .09, *se* = .04, *p* = .03).

Specifically, people who experienced the corona pandemic less positively, showed a stronger decline in their levels of life satisfaction with the onset of the corona measures at T3 (Figure 4a). At T4, when the anti-corona restrictions were relaxed again, there was no significant effect of a positive perception (*est* = .07, *se* = .03, *p* = .06). Contrary, when asking participants how negatively they experienced the corona pandemic, no significant influence of the perception of the life event on change in latent life satisfaction was noted (Figure 4b), (T3: *est* = .07, *se* = .05, *p* = .25; T4: *est* = .02, *se* = .03, *p* = .95).

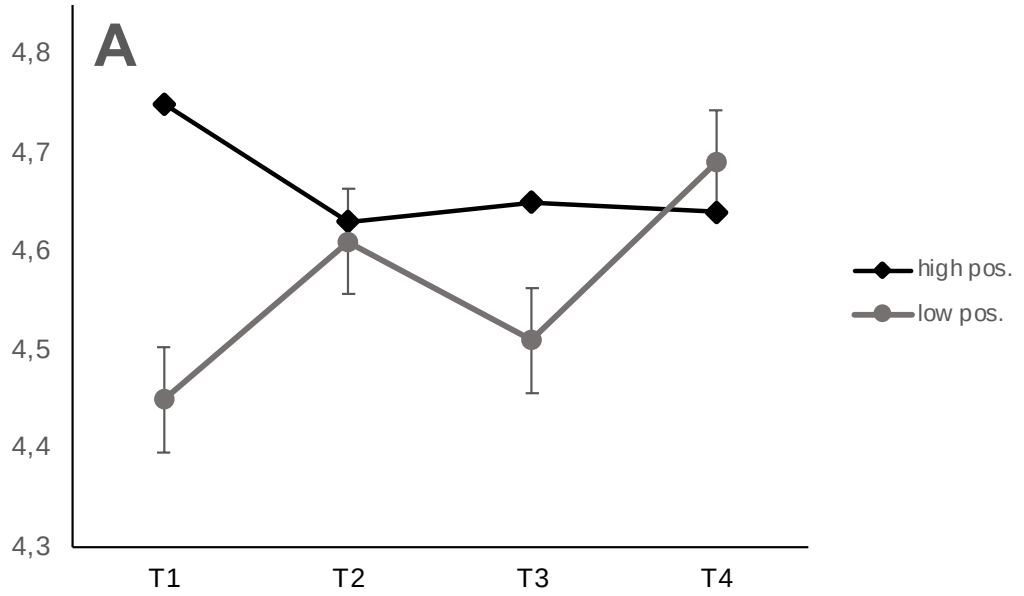

Figure 4a. Average life satisfaction splitted by high versus low positive perception of the corona pandemic across four measurement occasions (T1–T4)

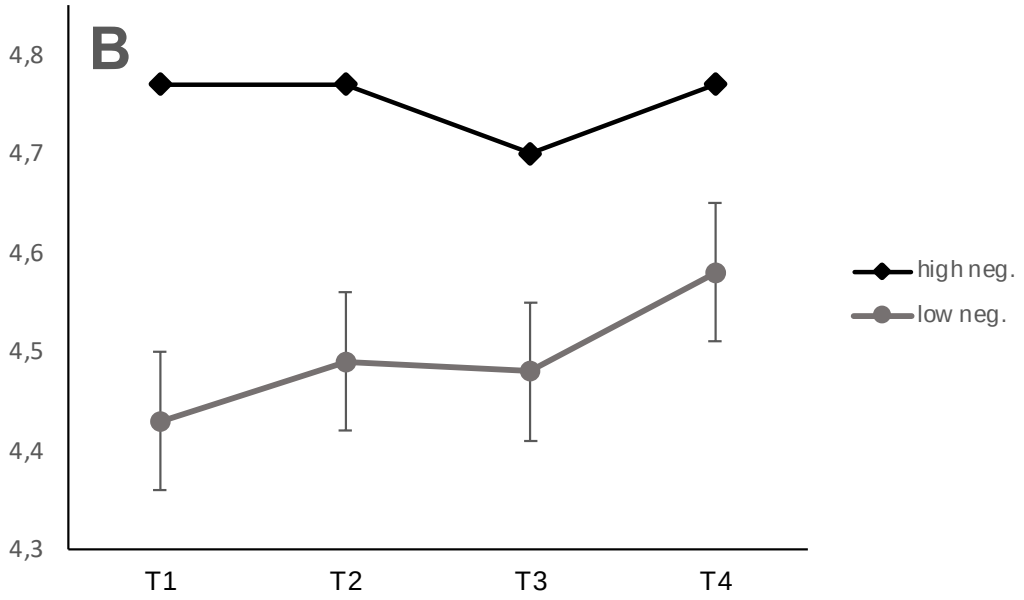

Figure 4b. Average life satisfaction splitted by high versus low negative perception of the corona pandemic across four measurement occasions (T1–T4)

Further, we tested whether self-efficacy as a protective factor might lessen the impact of COVID-19 related restrictions on life satisfaction. We conducted our analyses in consecutive steps. First, we tested for a main effect of self-efficacy and added self-efficacy to the model. The data fitted the model well (χ^2 = 355, *df* = 210, CFI = .984, RMSEA = .021, SRMR = .041). Self-efficacy showed

a significant effect on latent change in life satisfaction at T3 (*est* = .13, *se* = .05, *p* = .02). At this measurement occasion, people high in self-efficacy showed almost no change in life satisfaction, whereas life satisfaction dropped for emerging adults with low self-efficacy (Figure 5). Moreover, we found a significant latent covariance of self-efficacy and latent life satisfaction at T1 (*est* = .44, *se* = .04, *p* < .001). As depicted in Figure 5, participants with high levels of self-efficacy displayed also higher levels of life satisfaction from the beginning of our study.

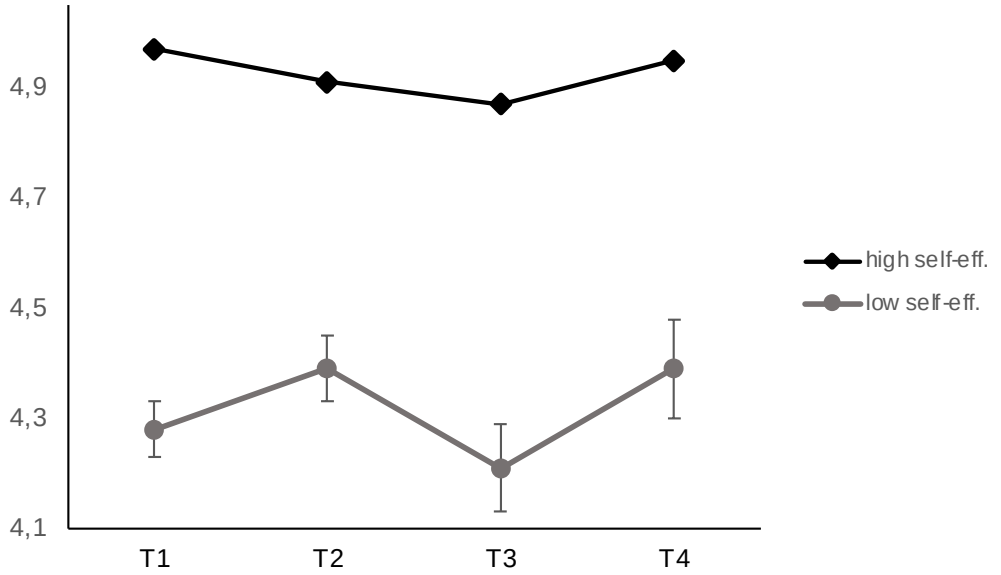

Figure 5. Average life satisfaction with regard to high versus low levels of self-efficacy across four measurement occasions (T1–T4)

Second, we tested for a moderating effect of self-efficacy. Adding a moderating variable to the model showed similar fit (χ^2 = 401, *df* = 246, CFI = .983, RMSEA = .020, SRMR = .041). However, as depicted in Table 3, neither for perceived positive (T3: *est* = .02, *se* = .04, *p* = .61; T4: *est* = -.05, *se* = .05, *p* = .35), nor for perceived negative valence (T3: *est* = -.03, *se* = .04, *p* = .47; T4: *est* = -.02, *se* = .05, *p* = .61), the moderator showed a significant effect on latent change in latent life satisfaction. Thus, the influence of the perception of the corona-crises on changes in life satisfaction was not moderated by expressions of self-efficacy.

Table 3.

Model fit parameters and estimates for the latent univariate change score model (see Figure 1), N = 1,944

Model	χ2(df)	*p*(χ2)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR	ΔLS1	ΔLS2	ΔLS3	
H1	295 (158)	<.001	.984	.981	.025	[.020 – .029]	.044	-.024	-.025	.081	
								P-T3p→ΔLS2	P-T3n→ΔLS3	P-T4p→ΔLS2	P-T4n→ΔLS3
H2	336 (194)	<.001	.984	.981	.023	[.019 – .027]	.043	.091*	.071	.066	.018
								SE→ΔLS2	SE→ΔLS3		
H3	299 (161)	<.001	.985	.981	.024	[.020 – .028]	.043	.130*	.095		
								ModT3p→ΔLS2	ModT3n→ΔLS3	ModT4p→ΔLS2	ModT4n→ΔLS3
								.021	-.046	-.031	-.024

Note. X^2 = chi-Square value; Df = degrees of freedom; CFI = comparative fit index, should be above .90; RMSEA = root mean square error of approximation, should be below .08; SRMR = standardized root mean square residual, should be below .05; Δ-LS = change in life satisfaction; V-p/n → ΔLS = latent regression coefficient of perceived positive (p) or negative (n) valence of the corona pandemic on latent change in life satisfaction; SE → ΔLS = latent regression coefficient of self-efficacy on latent change in life satisfaction; MOD p/n → ΔLS = latent regression coefficient of the moderator for positive (p) and negative (n) valence on latent change in life satisfaction at T3 and T4

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

Discussion

The measures to reduce the spread of the COVID-19 have drastically altered emerging adults' lives. The current study focused on the dynamics of subjective life satisfaction and the collectively experienced critical life event, the corona pandemic. We provide comprehensive information on data before and during the pandemic, including separate measurement occasions during a strict lockdown and when the implemented restrictions were relaxed again. Although no general decline in life satisfaction was noted, we found profound differences in interindividual change when accounting for the perception of the pandemic. Further, we found a main effect of self-efficacy on life satisfaction at T3, the onset of the corona measures. However, expressions of self-efficacy were unrelated to the influence of the perception of the pandemic on self-reported life satisfaction.

Mean Change in Life Satisfaction

In the current sample of emerging adults in Germany, no general change in subjective life satisfaction with regard to the corona measures was found. Despite a tendency towards a decline at the onset of the corona pandemic and a tendency towards an increase half a year later, participants' levels of average life satisfaction were not significantly different across the four measurement occasions. There might be several possible explanations. First of all, past research has shown that life satisfaction constitutes a rather stable construct which is not easily affected by environmental influences (e.g., Headey & Wearing, 1989; Myers & Diener, 2018). Mean levels of life satisfaction tend to vary little across the life span and only heavy disruptions provoke lasting change in subjective life satisfaction (Clark et al., 2008; Lucas et al., 2004). This stands in line with the assumptions of the earlier described Set Point Theory. Set Point Theory proposes that people have a determined set point for their personality traits and that only decisive environmental influences can permanently change this set point (Anusic et al., 2014; Lucas et al., 2004; Yap et al., 2012). Further, the underlying key mechanism of Set Point Theory is adaptation. Thus, on the one hand, the implementations to reduce the spread of the corona pandemic might not have been decisive enough, to evoke far reaching changes in emerging

adults' overall attitude towards one's life. On the other hand, emerging adults might have successfully and quickly adapted to the stressors of the pandemic. Thus, they might have figured out a way of coping without having their average life satisfaction being influenced lastingly, or at least not as long lasting so that the measurements used in the current study could have detected such change.

Furthermore, in a large German panel data set, van Praag and colleagues (2003) identified the most important determinants of overall life satisfaction: health, family, and finances. In terms of health, there were fewer identified cases of COVID-19 in children and emerging adults, they experienced less severe courses of infection and fewer deaths were reported (WHO, 2021). Regarding family, emerging adults still depend on their social home environments, thus, in comparison to many other individuals, a reduction of social contacts might not have directly resulted in isolation. Moreover, most of emerging adults still rely on financially dependencies to e.g., parents. Therefore, they might have experienced possible financial repercussions merely as indirect stressors.

Another explanation might be related to inter-individual differences in the volatility of life satisfaction and the mere assessment of average life satisfaction. Headey and Muffels (2018) investigated dynamics in life satisfaction over 25 years in Germany and found that some people experience a lot of volatility in subjective life satisfaction, even though their overall mean level of life satisfaction changes barely over time. For example, high levels of neuroticism are associated with low average life satisfaction but high volatility. Further, along with other aspects such as behavioral choices and socio-economic characteristics, life satisfaction volatility seems to be also related to age, with its highest variability in teenage years (Headey and Muffels, 2018). With regard to the corona pandemic, forced restrictions might have influenced emerging adults on very different dimensions in daily living. Since the beginning of the pandemic, a great number of studies reported declines in closely related constructs to well-being. For example, in a large longitudinal study, Lee et al. (2020) reported increases in loneliness in young adults with the onset of the pandemic. Likewise, using data from a large-scale daily diary study in Germany, Buecker and Horstmann (2021) found that the quality of social

relationships was perceived worse during compared to before the pandemic. Moreover, the numbers of studies reporting psychological distress, mental health problems as well as socio-economic implications for young people seem endless (e.g., Nicola et al., 2020; Rogowska et al., 2020; Xiong et al., 2020; Zacher et al., 2021). Therefore, overall life satisfaction levels may not reflect experiences during the pandemic precisely enough and even if the subordinate expressions of average life satisfaction remain stable, emerging adults still might have experienced phases of distress. Together, these examples illustrate how important it is to look out for underlying processes which might account for change in well-being and individual life satisfaction.

Perception of the Corona Pandemic

Correspondingly, our results revealed a different picture when we asked participants how they perceived the corona pandemic. With regard to our second research question, we found a significant effect for positive valence on life satisfaction. According to how positively participants perceived the corona pandemic, they experienced a differential change in subjective life satisfaction at the onset of the restrictions. More specifically, people who stated they experienced the corona pandemic less positively, showed a stronger decline in their levels of life satisfaction at the beginning of the corona measures. Interestingly, this group of participants displayed a greater increase of life satisfaction on T4, even slightly above those, who experienced the corona pandemic on average more positively (see Figure 4a). Presumably, it seems like the relief was stronger for those who struggled more, resulting in a slight boost of subjective life satisfaction. Compared to the harsh lockdown spring 2020, in autumn 2020 at the time of T4, a lot of restrictions were lifted in Germany, with open schools and restaurants, and social contact, allowing emerging adults' lives to normalize.

Contrary, we found no significant effect regarding negative valence. Thus, the degree of negative perception did not predict changes in life satisfaction. Nonetheless these results should be interpreted with caution. The scope of the present study only enables to highlight short-term consequences of the corona pandemic, whereas negative long-term effects on well-being and especially

mental health are still unknown. Moreover, age and current life stages have implications for how an individual can perceive events (Cohen et al., 2019). Thus, future research should compare the results of the current study to different age groups and account for external additional stressors beyond the corona pandemic.

As such, our results illustrate once more the importance to differentiate between the assessment of the mere occurrence of a critical life event and how people perceive them. Our findings stand in line with previous research which has demonstrated that trajectories corresponding personality trait change (de Vries et al., 2021; Haehner et al., 2021, Rakhshani et al., 2021), subjective well-being, and mental health (Fassbender et al., 2021; Luhmann et al., 2020) show different patterns when accounting for a person's perception of an event. In the current study, our findings on perceived valence imply a direct association of how people perceive the restrictions of the pandemic and their subjective well-being. Apparently, emerging adults show individual differences in dealing with and adapting to the pandemic which gives ground for our third research question– addressing internal resources people might rely on when facing critical life events.

The Impact of Self-Efficacy

Past research demonstrates the need to consider potential moderators of the relationship between event perceptions and personality traits, and to explore how certain associations differ between people (e.g., Haehner et al., 2021; Rakhshani et al., 2021). Since internal resources have been shown to influence coping with the pandemic (Rogowska et al., 2020), we focused on a personality trait that might protect from negative effects of the corona measures. Thus, we investigated whether self-efficacy acts as a protective factor and buffers the negative influence on life satisfaction. Interestingly, self-efficacy showed a direct effect on delta life satisfaction at T3 when the corona measures were first implied. Moreover, our results indicated that emerging adults with high versus low expressions of self-efficacy differ in their overall level of life satisfaction from the beginning of our study. However, self-

efficacy did not moderate the relationship between the perception of the corona pandemic (either positive or negative) and related changes in life satisfaction.

Since self-efficacy describes the inherent belief to be able to rely on one's competencies, people might feel more capable to overcome the obstacles related to and associated with the anti-corona measures. It has been shown that people with a strong sense of self-efficacy also have the ability to regulate cognitive, motivational, and affective processes more easily (Bandura, 1977). With regard to changes in life satisfaction, research suggests that people typically experience periods in life where they are increasingly happy or increasingly unhappy (Headey & Muffels, 2018). Correspondingly, it can be argued, that self-reported life satisfaction stays rather stable, even in the face of critical life events because people high in self-efficacy are able to process the implementations of the pandemic more effectively. For example, they might "rise up" to the concrete challenge when working from home and mastering children day care at the same time. With regard to emerging adults, this could imply keeping up with social contacts by enforcing online meetups, maintaining physical exercises and hobbies or adapting to corona measures in creative ways. In turn, this task could be responsible for periods in which their life satisfaction moves above or below the individual long term mean of life satisfaction but without triggering a prolonged disruption.

In sum, our results highlight the importance of reporting trajectories in life satisfaction with regard to the corona measures, the perception of such events as well as internal factors that influence these. While we found a main effect of the perception of the pandemic and self-efficacy, no average decline in life satisfaction was noted. However, one should not underestimate the impact of the corona pandemic, as research across various domains have shown how the pandemic interferes with individual psychological well-being (e.g., Armour et al., 2020) and long-term consequences on general well-being are still unknown. To systematically develop effective intervention strategies, research should focus on underlying mechanisms of how and why people cope differently with the implementations of the corona pandemic, and to identify vulnerable groups of individuals. With ongoing high numbers of

infections and related restrictions on daily living, our results help identifying possible buffering effects to maintain psychological well-being of emerging adults.

Limitations and Future Directions

The current results shed light on the distinctive nature of the perception of critical life events. However, despite positive and negative valence, more characteristics of life events should be addressed in future research. To account for a whole picture on the influence of critical life events, for example, the predictability, impact, emotional significance, and challenge could be assessed (Kendler et al., 2003; Luhmann et al., 2020). With proceeding measurement occasions, we considered the most recent research on the assessment of life events but at our measurement occasion T3, no other information than perceived valence was assessed. Therefore, for reasons of comparability to T4, we focused on perceived positivity and negativity of the corona pandemic.

Moreover, there are some limitations concerning our sample. Even though the sample was quite large, we only examined trajectories of life satisfaction for emerging adults in Germany that self-selected in our panel study. This sample might differ from other populations in the perception of the corona pandemic, since other countries were exposed to a harsher lockdown and even more restrictions on daily living. As the corona pandemic effected emerging adults all over the world, it would be fruitful for future research in this area to review and compare our findings on subjective well-being to other communities and cultures except for western industrialized countries such as Germany. Moreover, caution should be taken when comparing our results to other findings, since the effects of the perception of the corona pandemic and self-efficacy on life satisfaction were yet significant but rather small. Further, our sample consisted predominantly of female participants. Although we gathered data from diverse participants all over Germany, the higher percentage of female emerging adults might be explained by self-selection to voluntary participate in a research study.

Further, we assessed self-efficacy at the beginning of our investigation. The benefit of this approach is that the self-efficacy measure was unrelated to possible interfering corona content.

However, self-efficacy constitutes a trait which is developing with time. Thus, levels of self-efficacy might have changed during our investigation over a period of three years and recent self-efficacy might have changed accordingly.

Conclusion

The present study is one of the first analyzing comprehensive longitudinal data on life satisfaction with assessments before and during the pandemic, as well as when tight anti-corona restrictions were relaxed again. We aimed at investigating how the COVID-19 pandemic influences trajectories in life satisfaction in emerging adults. Life events such as the corona pandemic are complex and perceived quite differently. Therefore, we disentangled associations between the perception of the corona pandemic and the personality trait self-efficacy which might buffer the influence of the restrictions on subjective life satisfaction. While we found no evidence for a general decline, perceived positive valence and self-efficacy were associated with change in life satisfaction at the onset of the COVID-19 measures. Our results imply that life events encompass meaningful changes in individual well-being and more studies are needed to enrich practical implications to deal with the consequences of the pandemic.

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CHAPTER 5

General Discussion

General Discussion

People change as they age, and often, this change is determined by the critical life events we experience across the lifespan (Bleidorn et al., 2018; Denissen et al., 2019; Luhmann et al., 2012; Luedke et al., 2011). The present dissertation sought to investigate the sources, processes, and consequences of life events to advance our understanding of related development in personality and well-being. Across the three articles, different aspects of the interplay between core beliefs, such as mindset and self-efficacy, and the perception of life events were discussed in an attempt to outline a comprehensive picture on the influence of critical life events. In this section, I provide a summary and overview of the most important aspects of each study before discussing the broader scope of this dissertation. In addition to the study-specific shortcomings already mentioned in each chapter, I elaborate on limitations of the present dissertation. Finally, future research opportunities and practical implications are discussed.

Study 1. Personality Development in Emerging Adulthood – How the Perception of Life Events and Mindset Affect Personality Trait Change. The first study of this dissertation aimed at improving our understanding of personality trait development during the critical period of emerging adulthood with respect to two decisive critical life events: graduation from school and moving away from the childhood home for the first time. Likewise, personality change was investigated with regard to the perception of these two particular life events as well as with regard to how mindset moderates the impact of life events and perceptions of them on personality trait change.

In line with the maturity principle (Roberts & Mroczek, 2008), results in Study 1 indicated increases in levels of personality traits that are associated with mature development. Although the effects were small, the results revealed significant increases in extraversion, openness, conscientiousness, and emotional stability, and to a lesser degree agreeableness, over a one-year period. I had hypothesized that experiencing the two life events would influence the development of personality. However, no effects for merely experiencing either critical life event was found, which

stresses the further finding even more: when accounting for one's subjective perception of the event *graduation,* the results indicated significant personality change in extraversion and neuroticism. Specifically, when participants experienced this life event negatively, a greater increase in neuroticism was noted. In turn, when the event was evaluated positively, a greater positive change in extraversion was found. These findings support the current debate around focusing on life event–characteristics such as valence (Haehner et al., 2021; Luhmann et al., 2020; Rakhshani et al., 2021), while also supporting prior concerns by Luhmann et al. (2020) that merely assessing whether one has experienced certain life events can obscure effects on changes in traits. Furthermore, with regard to the moderating role of mindset, results showed a significant influence of the moderator when assessing the perception of graduating from school for extraversion. More precisely, a fixed mindset indicated less change in extraversion when experiencing the critical life event *graduation*. Again, no significant effects for the critical life event of *moving away from home* were found.

Further, Study 1 stressed the importance of the particular life event of *graduation*, which has not been empirically examined thoroughly (for an exception see Bleidorn, 2012). It showed that young adults perceive this event in different ways. While some might experience graduation as exciting and have already started thinking about future plans, others might perceive graduation as a source of pressure, involving expectations from parents, teachers and even a possible fear of failure (Arnett, 2000; Wilt et al., 2016). Thus, more research is needed to elaborate on the perception of this specific event.

Besides the limitations already mentioned in the first study, it should be noted that Study 1 did not account for a direct effect of mindset on personality development. The direct influence of a growth versus fixed mindset on the Big Five might have served as an indicator of the willingness to change (more quickly) in a desired direction or in the direction of mature functioning (e.g., Dweck, 2017; Hudson et al., 2019). Thus, individual differences in personality change may have been driven by core

beliefs, but we were unable to provide a holistic picture of possible resilience factors in Study 1 (e.g., Infurna & Jayawickreme, 2019).

Another limitation of the first study concerns the data, which encompassed only two measurement occasions. This is suitable for presenting linear change, but does not allow for examining reversible and discontinuous change (Haehner et al., 2021; Infurna & Jayawickreme, 2019; Luhmann et al., 2014). Additionally, as mentioned previously, Study 1 only concentrated on two events, which does not comprehensively capture the vast number of possibly significant life events during young adulthood (Arnett, 2000; 2007; Bleidorn & Schwaba, 2017).

Nonetheless, the findings related to the event of *graduation* represent a relevant starting point for follow-up research, since graduation from school can be considered as a challenging event that encompasses cognitively demanding tasks, learning and intellectual engagement (Arnett, 2000; Wilt et al., 2016) – attributes that are not only associated with positive or negative affect, but also with the development of other trait domains, such as openness (Bleidorn, 2012; Luedtke et al., 2009; Luedtke et al., 2011). However, openness constitutes a very heterogenous trait domain (Costa & McCrae, 1995; Digman, 1990; Mussel et al., 2011; Schwaba et al., 2019). Thus, there was a need for a more fine-grained, in-depth investigation with more measurement occasions and a broader range of life events to capture the processes underlying personality trait change more comprehensively. Hence, the second study attempted to address these shortcomings with a three-wave, longitudinal study design, investigating personality change below the domain level with respect to the influence of non-specific critical life events.

Study 2. The Development of Intellect in Emerging Adults: A Longitudinal Study of Environmental Influences and Underlying Processes. Building upon the empirical knowledge obtained in the first study, the second study investigated the development of trait intellect, a facet of openness, in emerging adulthood and how it is influenced by the perception of critical life events and the implicit belief of self-efficacy. While results of Study 2 indicated significant changes in intellect

over the three measurement occasions, no evidence for an influence of experiencing a critical life event was found. Regarding implicit beliefs of self-efficacy, the findings showed no moderating role with respect to the development of intellect but exploratory socialization and selection effects of self-efficacy on intellect.

According to Social Investment Theory (SIT; Roberts et al., 2005), personality trait change can be explained by changes and investments in social roles (Roberts et al., 2005; Roberts & Wood, 2006). With respect to the development of intellect, I proposed that intellect would increase after experiencing life events that require thinking, learning, problem-solving, and understanding abstract matters. Thus, the results emphasize the bottom-up process within SIT, that the investments in social roles lead to changes in peoples' thoughts, feelings, and behaviors, which manifest as changes in personality traits (Roberts et al., 2005). However, whereas levels of intellect increased, the subjective perception of critical life events did not influence the development of intellect (socialization effects), nor did these subjective perceptions affect initial levels of intellect (selection effect). Whilst causally stringent, this approach may yield biased results because it was not possible to control which specific life event participants had in mind when filling out the survey on the second measurement occasion. Hence, participants might have concentrated on a life event that was neither individually meaningful enough, nor associated with intellectual engagement to evoke change in intellect over time (Denissen et al., 2019; Sutin et al., 2010; Von Stumm et al., 2011). Nonetheless, the surveyed individuals encountered changes in social roles and age-related life transitions that might explain changes in intellect levels. These include, for example, becoming more resilient, cooperative, and responsible in emerging adulthood (Costa et al., 2019). Thus, future research might take a closer look on possible overlaps and distinctions among intrinsic maturation, life experiences such as life events, and investment in social roles in order to carefully untangle their impacts on related personality change (Costa et al., 2019).

Another aspect of Study 2 that should be discussed more thoroughly concerns the findings on the influence of self-efficacy. Study 2 accounted for a core belief that is mostly associated with the

construct of control (Bandura, 1992; Maddux, 1991). The results indicated that participants high in intellect are more likely to exhibit higher levels of self-efficacy, and in turn, that self-efficacy encourages an extension of characteristics that intellect facilitates. For a deeper understanding of the interplay between intellect and self-efficacy, it is necessary to untangle associations to control beliefs more precisely. Research on the connection between control beliefs and personality change has a long history and has been investigated exhaustively in fields such as in educational, health, organizational, and clinical psychology (e.g., Dweck, 2017; Bandura, 1997; Judge & Bono, 2001; Rotter, 1954; Shapiro & Astin, 1998; Young & Brown, 1994). The labeling of overlapping constructs evolved similarly divergent: sense of control, personal mastery, perceived control, locus of control, learned helplessness, and primary and secondary control, just to name a few (Pearlin & Pioli, 2003; Rodin, 1990). Whereas constructs such as locus of control (Rotter, 1954) are described as an individual difference variables that captures individuals' beliefs about the degree of control they have over events, clinical research has more often considered behavioral outcomes mainly because behavioral change is assumed to be facilitated by a personal sense of control (Schwarzer & Fuchs, 1996; Shapiro & Astin, 1998). Yet another context for control beliefs derives from needs, as, along with other components, the need for control stems from our basic needs in life, which lead us to set goals that are designed to meet further needs (e.g., Dweck, 2017; Mussel, 2019). However, a mutual assumption of these approaches is that people who acquire a positive sense of control over their lives and believe that they can actively engage in it might become more confident about doing so and feel more committed to this decision (Bandura, 1997; Shapiro & Astin, 1998).

The examples illustrated above emphasize that different fields have different perspectives on how to promote, change, and maintain control beliefs with regard to life experiences. However, self-efficacy represents a slightly different construct that goes beyond mere control beliefs and outcome expectancies. While the degree to which people believe they have control over outcomes of life events refers to perceptions of the possible consequences of one’s actions, the construct of self-efficacy refers

to personal action control or agency (Bandura, 1992; Maddux, 1991). Accordingly, self-efficacy can be described as the perceived belief in a "can do"–cognition that conveys a sense of control over one's environment but in an adaptive and self-determined way (Schwarzer & Fuchs, 1996). Moreover, self-efficacy as an active belief can be regarded as an optimistic view of one's capacity to deal with external stressors (Schwarzer & Fuchs, 1996). This helps to contextualize the present findings on the interplay between intellect and self-efficacy. As mentioned in Study 2, intellect refers to the personality trait and motivational component, namely, the “will do” or “typically do” aspect (see Mussel, 2013, for a review). Combining this with the implicit belief of “can do”, in terms of the perceived confidence in one's own effectiveness of action, and intellect, it becomes clear that the two personality traits might complement each other when pursuing intellectually stimulating tasks that lead to changes in personality development. Overall, although the results in Study 2 could not find evidence for a moderating role of self-efficacy, the results on selection and socialization effects of self-efficacy indicate that more systematic research is needed to unravel possible interactions between intellect and self-efficacy and how control beliefs might influence the way we approach life events.

Study 3. Trajectories in Life Satisfaction Before and During COVID-19 with Respect to Perceived Valence and Self-Efficacy. The final study presented in this dissertation investigated the outbreak of the COVID-19 pandemic and its perception as a critical life event. This way, I incorporated a specific, meaningful life event, that has not yet been examined thoroughly and that has been shown to have far reaching implications on daily life (Buelow et al., 2021; Fosco et al., 2021; Ravens-Sieberer et al., 2021; WHO, 2020). Unlike to the previous studies, where I examined the impact on personality development, the third study broadens the scope of this dissertation by exploring the influence of life events on well-being. At the same time, I maintained focus on underlying mechanisms that might contribute to individual differences. Therefore, Study 3 examined the development of self-reported life satisfaction with assessments before and during the pandemic across four measurement occasions over a period of three years and considered the influence of self-efficacy on changes in life satisfaction.

First and foremost, altered levels in subjective life satisfaction were found when taking subjective perceptions of the pandemic into account. Specifically, people who stated they had experienced the pandemic as less positively exhibited a stronger decline in their levels of life satisfaction at the beginning of the mitigation measures. However, no significant changes in life satisfaction were found when the mere occurrence of the event was assessed. Thus, similar to Study 1, assessing the perception of a particular life event revealed influences on personality development and here, life satisfaction.

Second, as in Study 2, the implicit belief of self-efficacy did not moderate the relationship between the perception of the COVID-19 pandemic (either positive or negative) and related changes in life satisfaction. However, I addressed the shortcomings of the previous studies and considered the direct effect of this core belief on developments in the dependent variable. In Study 3, self-efficacy had a significant direct effect on change in life satisfaction on the third measurement occasion, the exact point at which the first pandemic mitigation measures were introduced. Moreover, the findings suggest that young adults with high versus low levels of self-efficacy differ in their overall levels of life satisfaction. Importantly, results indicated not only that the belief in one's innate abilities influences individual behaviors associated with the pandemic, but also that self-efficacy could be a significant resource that promotes young adult functioning and well-being through active coping (Yap & Baharudin, 2016).

As a shortcoming, the third study did not assess the development of self-efficacy over time, which would have been a fruitful addition to explore the processes underlying life satisfaction as well as the development of active coping strategies regarding COVID-19. According to Bandura (1997), self-efficacy is malleable and thus, can be changed through experiences (e.g., Ouweneel et al., 2013; Roditi et al., 2019). There is mixed evidence on how the COVID-19 pandemic affected the development of self-efficacy. Whereas some studies reported a significant drop in self-efficacy beliefs from before to during lockdowns (Ritchie et al., 2021), others suggest that self-efficacy remained

relatively stable during confinements (e.g., Joie-La et al., 2021). The latter is in line with recent models of self-efficacy, which support the notion that self-efficacy constitutes a stable resource for facing stressful situations and is self-sustaining through active coping mechanisms (Bayraktar & Jiménez, 2020; Luszczynska et al., 2005). Overall, investigating the longitudinal development of self-efficacy with respect to the COVID-19 pandemic with measurement occasions during periods of strict confinement and after restrictions were relaxed again could further improve our understanding of affective and cognitive appraisals in response to critical life events.

Implications for Personality Development and Well-Being

I investigated the influence of unspecific life events as well as particular life events such as school graduation, moving away from the childhood home for the first time, and the COVID-19 pandemic. In each case, particular focus was placed on the event characteristic *valence.* The present studies assessed not only related personality change regarding the broad domains of the Big Five (Study 1), but also personality development on the facet level, namely, in trait intellect (Study 2). Furthermore, the impact on personal well-being in terms of self-reported life satisfaction was examined (Study 3). Finally, the present dissertation added to the knowledge of underlying processes and individual differences in the processing of life events and investigated moderating effects of mindset and self-efficacy. Although not all possible associations and interactions with life events could be incorporated, the three studies addressed different aspects to the overarching research question concerning the influence of critical life events on life trajectories by improving our knowledge of how life events are integrated and processed.

Personality Development. The findings of the present dissertation provide evidence that life events influence personality development trajectories. More precisely, these effects were only significant when accounting for the appraisal of critical life events and assessed their subjective perception. Moreover, no moderating role of the core belief of self-efficacy was found. While results in Study 1 showed a significant influence of the mindset when assessing the perception of graduating

from school, self-efficacy did not moderate the influence of the perception of critical life events on changes in intellect or life satisfaction. However, the results suggest selection and socialization effects of self-efficacy on trait intellect (Study 2), as well as significant effects of self-efficacy on the development of life satisfaction (Study 3). Thus, the present analyses not only support previous research which emphasized that individual differences in personality development and well-being are associated with subjective life experiences (e.g., Burger & Samuel, 2017; Luedtke et al., 2011; Luhmann et al., 2020; Zheng et al., 2020), but also encourages recent research that has been integrating core beliefs into existing theories on the development of personality (Dweck, 2017; Dweck & Yeager, 2019; Mussel, 2019; Mussel et al., 2022).

The present results also illustrate that it might be worthwhile to conduct more fine-grained research on theses associations. This could be achieved by, for example, paying more attention to personality change on the facet level. This dissertation assessed personality change in openness below the domain level because of its heterogenous structure and significant differences among facets (Costa & McCrae, 1995; Schwaba et al., 2019; Mussel et al., 2011; Saucier, 1992), and thus, focused on the facet of intellect (Study 2). It might be fruitful to transfer this approach to other facets of openness such as fantasy and aesthetics, or even facets of the other Big Five domains (Costa & McCrae, 1995). For example, Loeckenhoff et al. (2009) found significant increases in the broad Big Five domain of neuroticism after experiencing adverse events. More precisely, the results suggested that anger and frustration increased, representing the angry-hostility facet of neuroticism. Meanwhile, compliance, a facet of agreeableness, decreased, meaning that individuals became less likely to cooperate and deescalate in interpersonal conflicts (Loeckenhoff et al., 2009; McCrae & Costa, 1996). Similarly, Bleidorn et al. (2009) identified divergent developmental trajectories in adults when comparing personality change on a domain versus facet level. Here, domain scales reflecting functional maturation of personality were not completely mirrored in the patterns of change on the facet level of, for example, the facets of extraversion (Bleidorn et al., 2009; Roberts et al., 2006). Thus, exploring personality

development on the facet level revealed meaningful changes that might be obscured on the domain level, and more investigations below the domain level might be needed to explore the influence and individual processing of critical life events (e.g., Mussel et al., 2011; Schwaba et al., 2019).

Well-Being. Personal happiness has been a key concern for individuals and societies across the ages (Diener et al., 1998), and correspondingly, life satisfaction has always been related to an impressive array of psychological outcomes such as health and longevity (Chida & Steptoe, 2008; Diener et al., 1998; Erdogan et al., 2012; Haar & Roche, 2010). With regard to implications for life satisfaction, this dissertation extended previous research by augmenting evidence not only on the impact of life events in general, but also on the implications of the COVID-19 pandemic for young adults in particular. The results show once more that critical life events affect our perceived life satisfaction and thus our physical and mental health (Arslan, et al., 2021; Buecker et al., 2020; Rogowska et al., 2020; Zacher et al., 2021). When reflecting on the broader scope of disruptions to well-being in societies around the world due to, for example, humanitarian crises (e.g., Jones et al., 2008; Morens & Fauci, 2020), the possible consequences of the pandemic appear to be even more pressuring, since several key questions remain unanswered. For example, long-term consequences of the COVID-19 pandemic for young adults on the physical and psychological levels cannot yet be foreseen (e.g., Fegert, et al., 2020; Zhou, 2020; Zimmermann et al., 2021). However, in light of the literature on lasting declines in life satisfaction due to critical life events (Clark et al., 2008; Lucas et al., 2007; Fujita et al., 2005), long-term changes in life satisfaction should be considered as a possible consequence. To follow up on these issues, future researcher may wish to expand investigations of coping mechanisms that encompass control beliefs. Moreover, there is a relative lack of evidence on the role of perceived valence with respect to the COVID-19 pandemic and well-being. In line with the present findings, prior research has shown that people who rated the pandemic as a challenge and the consequences of the pandemic as controllable, generally exhibited a higher level of subjective well-being (Zacher & Rudolph, 2021; Zheng, et al., 2020). Thus, a closer look at underlying psychological

processes is needed in order to develop COVID-19-specific interventions and to promote and restore young adults' well-being.

Implications for the Assessment of Life Events

A particular focus of this dissertation was the psychological assessment of life events. The present findings enrich current knowledge of the assessment of perceived event characteristics and underscore the importance of rethinking the operationalization of critical life events more generally. So far, prior research has suggested using categorical information on whether a life event was experienced or not, and thus, its mere experience (e.g., Headey & Wearing, 1989; Loeckenhoff et al., 2009; Luedtke et al., 2011; Kendler et al., 2003). For example, checklists have been used to determine the type and the frequency of life events experienced (Headey & Wearing, 1989), which were often filled out by researchers themselves or other people (e.g., Headey & Wearing, 1989; Holmes & Rahe, 1967). In so doing, researchers neglected individual differences in the perception of life events, and perhaps leading to misleading findings regarding the associations with outcome variables (Luhmann et al., 2020). The present dissertation sought to address these limitations by focusing on event characteristics on a continuous dimension, such as *valence,* which reflects the degree to which a critical life event is individually perceived as positive or negative. As such, we moved away from a static assessment of the "objective nature" of an event towards assessing the subjective perception of a critical life event, making it possible to identify and interpret individual differences in such perceptions.

My dissertation's findings support this reasoning. In Study 1, neiter of the particular life events *graduation* or *moving away from home* affected Big Five trait change over the two measurement occasions when the experience of the life events was assessed categorically. However, when analyzing how the two critical life events were perceived, associations with personality change in extraversion and neuroticism for the event *graduation* were found. In Study 3, no change in life satisfaction was apparent when examining the mere experience of the COVID-19 pandemic. However, when analyzing

positive valence, results in Study 3 indicated significant changes in life satisfaction accompanying the onset of the COVID-19 mitigation measures.

With respect to personality change and well-being, these results are in line with recent research that has concentrated on a dimensional approach to life events (Fassbender et al., 2021; Haehner et al., 2021; Rakhshani et al., 2021). For example, Haehner and colleagues (2021) examined in a cohort of young adults whether the perception of major life events was related to personality trait change and found that perceived valence was associated with changes in agreeableness and neuroticism, but not with changes in openness, conscientiousness, or extraversion. Another study by Jeronimus et al. (2013) used data from the Netherlands Study of Depression and Anxiety (NESDA) and found that a positive perception of critical life events was related to lower scores in neuroticism than a negative perception.

However, Luhmann et al. (2020) argue that even life events in the same domain or with similar valence differ in their effects on psychological outcomes and that when focusing on only one characteristic of life events, many other differences among critical life events are ignored. From different areas of research, we know that other characteristics, such as, for example, environmental and personal cues, are used to interpret situational perceptions (e.g., Parrigon et al., 2017; Rauthmann et al., 2014), and other frameworks have been developed to explain differences in event processing (e.g., Affective Adaptation Model, Wilson & Gilbert, 2008). To include this knowledge in the assessment of critical life events, Luhmann et al. (2020) developed a taxonomy comprising of nine perceived characteristics: valence, impact, predictability, challenge, emotional significance, change in world views, social status changes, external control, and extraordinariness. Recent research on these characteristics has shown that perceived event characteristics change over time, with e.g., changes in world views and a significant decrease in extraordinariness (Haehner et al., 2021). Moreover, Luhmann et al. (2020) found that differential changes in life satisfaction following an experienced event were significantly moderated by its perceived valence.

In sum, the present findings represent a promising starting point for further investigations on event characteristics. However, the reported studies in my dissertation only accounted for the event characteristic *valence.* Thus, I recommend the furthering use of diverse event characteristics along with prospective longitudinal studies to gain a comprehensive understanding of the influence of critical life events on personality development and well-being (Bleidorn et al., 2020; Luhmann et al., 2014; Rakshiani et al., 2021).

Limitations and Future Directions

The three reported studies have great strengths in terms of pursuing novel research questions and attempting to gather comprehensive information on the influence of critical life events and underlying processes. However, there are also some limitations and loose ends that have not yet been discussed thoroughly. This section closes with an outlook to possible future research and practical implications.

Methodological Shortcomings. In addition to the general limitations of self-reports in personality psychology (for a discussion see Bleidorn et al., 2020), some methodological shortcomings of the present dissertation need to be discussed. First of all, there are some limitations concerning the sample. To account for changes in personality and well-being over time, we created and obtained data from a large German longitudinal sample (GePP; Mussel, 2021). The panel utilizes a data set which was collected in Germany, a Western, educated, industrialized, rich, and democratic country (WEIRD; Henrich et al., 2010). Additionally, the present dissertation focuses on young adulthood; thus, the sample comprises this demographically and subjectively distinct period within the adult life course in WEIRD countries (Arnett, 2000, 2007). Therefore, no intercultural comparisons are possible, which is, unfortunately, also the case for a majority of studies on personality trait development (Bleidorn et al., 2020).

Moreover, there are some methodological aspects that could be improved and elaborated on future research. First, I only considered moderator effects of core beliefs in the three studies. If

significant, such effects would signify that certain associations are different for different people (Judd et al., 2014). However, in order to draw conclusions about the processes underlying core beliefs, it might be useful to also explore mediation effects in order to explain the processes through which life events and changes in personality or well-being are related. Second, there are some limitations concerning the models used for the life events in Study 1, since we changed our approach to life events as our knowledge progressed. The first study assessed the perception of life events on one dimension, and thus, with only one continuous rating variable. However, positive and negative affect are two distinct constructs that need to be considered separately (Dejonckheere et al., 2021; Luhmann et al., 2020; Zammitti et al. 2021). Therefore, we applied this approach in the subsequent studies; nevertheless, the findings of the first study need to be interpreted with caution.

Future Directions. The results in the present dissertation were not compared to other age groups or life stages. However, Cohen et al. (2019) emphasized that age and certain life stages can have implications for how an individual perceives life events. Hence, comparing differences and similarities to other age groups remains to be examined in future research. Likewise, none of the presented studies accounted for gender differences. Men and women might perceive (stressful) life events differently due to divergent cortisol regulation (Dedovic et al., 2009). Moreover, there might be a need to consider gendered exposure to life events due to socialized gender roles (Lavoie et al., 2019). Accordingly, future research should consider age and gender differences in order to explore subjective perceptions of life events more comprehensively.

Beyond the consideration of demographical variables, there are some contextual aspects which could be highlighted in future research. A promising path for following studies might be to compare the two core beliefs I focused on. Very few studies have investigated self-efficacy and mindset together, although the present dissertation indicates many similarities between them regarding the processing of life events and related psychological outcomes (e.g., Bai & Wang, 2020; Tassell et al., 2020). Furthermore, it could be interesting to explore personality development with regard to the

COVID-19 pandemic. Since Study 3 has demonstrated that the COVID-19 pandemic constitutes a meaningful life event that alters levels of life satisfaction in young adults, personality development might be affected in a similar way. Here, it could be assumed that, for example, trait openness decreases (permanently) due to the implied restrictions and enduring diminished social contact (Buecker et al., 2020). Moreover, levels in neuroticism might have increased due to, e.g., uncertainty about the situation – although there are mixed findings for this trait so far (e.g., Sutin et al., 2020). Altogether, considering the influence on personality traits could further explain individual appraisals to the pandemic and might unravel related changes in well-being. Again, these associations should be best observed longitudinally on the facet level.

Practical Implications. Using a large longitudinal sample of adolescents and emerging adults, the present dissertation provides practical implications by shedding light on this particularly vulnerable group (Arnett, 2000; Bleidorn et al., 2020). As mentioned earlier, young adulthood represents a critical time period which is characterized by common shared developmental milestones and the common experience of certain critical life events (Specht et al., 2014). The results indicate that this age is also characterized by individual differences in the perception of critical life events (Studies 1 and 3) and that especially in early adolescence, the personality trait intellect, and thus the engagement in problem-solving, learning and information seeking, significantly increases (Study 2). Moreover, with respect to the COVID-19 pandemic, the results underscore the notion that some young adults experienced the implications of the corona measures as more pressuring which resulted in a decrease in life satisfaction. These findings are in line with recent research on mental health issues like increases in depression and anxiety symptoms due to the COVID-19 pandemic (e.g., Arslan & Leung, 2021; Cohen et al., 2021, Gawrych et al., 2021; Zacher & Rudolph, 2021). Overall, the results can be used to inform tailored interventions for young adults and to highlight differences in coping with respect to the processing of life events such as the COVID-19 pandemic.

Conclusion

Trajectories in life can be altered through the experience of critical life events. Much has been achieved by investigating the impact of life events on personality development and well-being. However, there was a recent call for empirical research that devotes more efforts to explore underlying processes and mechanisms that determine individual differences when experiencing life events. The present dissertation contributes to this debate by facilitating a view from different angles. Thus, the influence of specific and nonspecific life events on the broad Big Five domains as well as on intellect, a facet of openness, was examined, along with the moderating role of the core beliefs mindset and self-efficacy. The three reported studies emphasize that critical life events can interrupt and redirect our paths in life and that both personality and well-being can be influenced through the way we perceive life events. Concurrently, the findings in this dissertation provide further evidence on how mindset and self-efficacy interact with personality development and subjective life satisfaction. As a further main contribution, the present results enrich knowledge on the assessment of critical life events: not only has the present dissertation demonstrated that people perceive life events differently, but also showed that subjective event perceptions may explain altered change in personality traits and well-being. In a nutshell, the reported results imply that life events encompass meaningful changes in individual life trajectories in young adulthood. However, further longitudinal research is needed that focuses on the subjective perception of critical life events, accounts for cultural aspects and differences in demographical variables, compares the influence of different core beliefs, and considers more event characteristics.

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Appendix A

Supplementary Information to Chapter 2

Appendix A

Supplementary Material for the Manuscript: Personality Development in Emerging Adulthood – How the Perception of Life Events and Mindset Affect Personality Trait Change (Study 1)

The supplementary material can also be accessed via: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.671421/full#supplementary-material

Table S1.

Fit indices for measurement models with increasing degree of invariance across time, n = 1,243

Model	χ2	*df*	*p*(χ2)	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Extraversion								
Model 1: Configural invariance	4.47	5	.48	1.00	1.00	.00	[.00 – .04]	.01
Model 2: Metric invariance	9.82	7	.20	1.00	1.00	.02	[.00 – .04]	.02
Model 3: Strong invariance	13.08	8	.00	1.00	1.00	.02	[.00 – .04]	.02
Emotional Stability								
Model 1: Configural invariance	3.95	5	.56	1.00	1.00	.00	[.00 – .03]	.01
Model 2: Metric invariance	20.80	7	.00	.99	.98	.04	[.02 – .06]	.03
Model 3: Strong invariance	21.01	8	.01	.99	.98	.04	[.02 – .06]	.03
Agreeableness								
Model 1: Configural invariance	16.43	5	.01	.99	.98	.05	[.02 – .07]	.02
Model 2: Metric invariance	19.70	7	.01	.99	.99	.04	[.02 – .06]	.02
Model 3: Strong invariance	23.19	8	.00	.99	.98	.04	[.02 – .06]	.02
Conscientiousness								
Model 1: Configural invariance	1.26	5	.94	1.00	1.00	.00	[.00 – .01]	.01
Model 2: Metric invariance	7.41	7	.39	1.00	1.00	.01	[.00 – .04]	.02
Model 3: Strong invariance	9.38	8	.31	1.00	1.00	.01	[.00 – .04]	.02

Table S1 – continued from previous page	$\chi 2$	*df*	$p(\chi 2)$	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR
Openness								
Model 1: Configural invariance	24.92	5	.00	.98	.94	.06	[.04 – .06]	.02
Model 2: Metric invariance	40.32	7	.00	.96	.92	.06	[.04 – .06]	.03
Model 3: Strong invariance	49.77	8	.00	.96	.92	.07	[.05 – .08]	.03

Note. Model fit parameters and estimates for the latent change model (see Figure 1). $\chi 2$ = chi square difference statistic; df = degrees of freedom; $p(\chi 2)$ = significance of chi square difference statistic; CFI = Comparative Fit Index, should be above 0.90; TLI = Tucker–Lewis index, should be above 0.90; RMSEA = root mean square error of approximation, should be below 0.08; RMSEA 90 %CI = 90 % confidence interval of RMSEA; SRMR=standardized root mean square residual, should be below 0.05; CLE→Δ = Regression weight lambda of the critical life event, as a measure of how the critical life event/ perception of life event influences changes in the Big Five traits from T1 to T2; CLE→Δ *(p)*= significance of critical life event/ perception of life event; $\mu\Delta$ = intercept of latent change score; $p(\mu\Delta)$ = significance of latent change score

Table S2.

Fit indices for measurement models of life events and the perception of life events, n= 1,243

Model		$\chi2(df)$	$p(\chi2)$	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR	*CLE →Δ*	*CLE →Δ(p)*	*μΔ*	*μΔ (p)*
Graduating from school yes/no												
	Emotional Stability	89.55(16)	.00	.94	.93	.06	[.04 – .07]	.04	-.00	.73	1.33	.00
	Extraversion	19.70(16)	.23	1.0	1.0	.01	[.00 – .03]	.02	-.03	.55	.75	.00
	Openness	50.84(16)	.00	.96	.95	.04	[.03 – .05]	.03	.01	.85	1.96	.00
	Agreeableness	45.62(16)	.00	.99	.98	.04	[.03 – .06]	.03	-.02	.16	1.35	.00
	Conscientiousness	13.27(16)	.65	1.0	1.0	.00	[.00 – .02]	.02	-.01	.79	1.51	.00
Moving away yes/no												
	Emotional Stability	69.11(16)	.00	.96	.94	.05	[.04 – .06]	.05	-.02	.08	.94	.00
	Extraversion	29.36(16)	.00	.99	.99	.03	[.01 – .04]	.03	.05	.25	.77	.00
	Openness	58.25(16)	.00	.95	.94	.05	[.03 – .06]	.04	.01	.91	1.96	.00
	Agreeableness	41.30(16)	.00	.99	.98	.04	[.02 – .05]	.03	-.02	.23	1.64	.00
	Conscientiousness	17.65(16)	.35	1.0	1.0	.01	[.00 – .03]	.02	-.04	.07	1.51	.00

Table S2 – continued from previous page

Perception of graduating school											
	Emotional Stability	94.07(16)	.00	.92	.90	.07	[.06 – .08]	.05	.05	.02	-.06	.00
	Extraversion	23.90(16)	.00	1.00	.99	.02	[.00 – .04]	.03	.10	.05	.76	.00
	Openness	43.22(16)	.00	.96	.95	.04	[.03 – .06]	.03	-.01	.90	1.87	.00
	Agreeableness	38.49(16)	.00	.99	.98	.04	[.02 – .05]	.03	.03	.23	1.58	.00
	Conscientiousness	30.46(16)	.02	.99	.99	.03	[.01 – .05]	.03	.02	.48	1.58	.00
Perception of moving away											
	Emotional Stability	56.75(16)	.00	.94	.92	.06	[.05 – .08]	.05	.02	.37	-.07	.01
	Extraversion	14.12(16)	.59	1.00	1.00	.00	[.00 – .03]	.02	-.01	.83	.72	.00
	Openness	46.41(16)	.00	.94	.92	.05	[.04 – .07]	.04	.02	.74	2.03	.00
	Agreeableness	32.46(16)	.01	.98	.98	.04	[.02 – .06]	.03	.01	.81	1.63	.00
	Conscientiousness	24.98(16)	.07	.99	.99	.03	[.00 – .05]	.04	-.05	.20	1.70	.00

Note. Model fit parameters and estimates for the latent change model (see Figure 1). $\chi 2$ = chi square difference statistic; df = degrees of freedom; $p(\chi 2)$ = significance of chi square difference statistic; CFI = Comparative Fit Index, should be above 0.90; TLI = Tucker–Lewis index, should be above 0.90; RMSEA = root mean square error of approximation, should be below 0.08; RMSEA 90 %CI = 90 % confidence interval of RMSEA; SRMR=standardized root mean squareresidual, should be below 0.05; CLE→Δ = Regression weight lambda of the critical life event, as a measure of how the critical life event/ perception of life event influences changes in the Big Five traits from T1 to T2; CLE→Δ *(p)*= significance of critical life event/ perception of life event; $\mu\Delta$ = intercept of latent change score; $p(\mu\Delta)$ = significance of latent change score

Table S3.

Fit indices for measurement models for life events and mindset, n = 1,243

Model	$\chi2(df)$	$p(\chi2)$	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR	*Mod→Δ*	*Mod→ Δ(p)*	*μΔ*	*μΔ (p)*
Graduating from school yes/no											
Emotional Stability	58.49(16)	.00	.97	.96	.05	[.03 – .06]	.04	.01	.54	1.33	.00
Extraversion	24.30(16)	.08	1.00	1.00	.02	[.01 – .04]	.02	.02	.68	.75	.00
Openness	53.66(16)	.00	.96	.94	.05	[.03 – .06]	.04	-.02	.67	1.96	.00
Agreeableness	37.95(16)	.00	.99	.99	.03	[.01 – .04]	.03	-.02	.30	1.65	.00
Conscientiousness	15.80(16)	.47	1.00	1.00	.00	[.00 – .03]	.02	-.02	.44	1.52	.00
Moving away yes/no											
Emotional Stability	66.04(16)	.00	.96	.95	.05	[.04 – .06]	.05	.01	.48	1.33	.00
Extraversion	28.78(16)	.03	.99	.99	.03	[.01 – .04]	.02	-.05	.30	.74	.00
Openness	50.73(16)	.00	.96	.95	.04	[.03 – .06]	.04	-.01	.76	1.96	.00
Agreeableness	31.21(16)	.01	.99	.99	.03	[.02 – .04]	.03	-.01	.75	1.65	.00
Conscientiousness	20.84(16)	.19	1.00	1.00	.02	[.00 – .03]	.03	-.02	.43	1.51	.00

Table S3 – continued from previous page

Perception of graduating school											
Emotional Stability	58.00(16)	.00	.96	.94	.05	[.04 –.07]	.04	-.00	.97	1.51	.00
Extraversion	25.62(16)	.06	.99	.99	.03	[.00 – .04]	.03	-.09	.05	.75	.00
Openness	41.62(16)	.00	.96	.95	.04	[.03 – .06]	.04	-.04	.45	1.87	.00
Agreeableness	34.66(16)	.00	.99	.98	.03	[.02 – .05]	.03	.01	.82	1.56	.00
Conscientiousness	20.46(16)	.20	1.00	1.00	.02	[.00 – .04]	.02	-.01	.75	1.57	.00
Perception of moving away											
Emotional Stability	43.03(16)	.00	.96	.95	.05	[.03 – .06]	.05	.01	.42	1.69	.00
Extraversion	24.49(16)	.08	.99	.99	.03	[.00 – .05]	.04	-.09	.15	.70	.00
Openness	45.87(16)	.00	.94	.92	.05	[.04 – .07]	.04	.08	.29	2.12	.00
Agreeableness	19.60(16)	.24	1.00	1.00	.02	[.00 – .04]	.03	.00	1.00	1.63	.00
Conscientiousness	21.24(16)	.17	.99	.99	.02	[.00 – .05]	.03	.03	.31	1.72	.00

Note. Model fit parameters and estimates for the latent change model (see Figure 1). $\chi 2$ = chi square difference statistic; df = degrees of freedom; $p(\chi 2)$ = significance of chi square difference statistic; CFI = Comparative Fit Index, should be above 0.90; TLI = Tucker–Lewis index, should be above 0.90; RMSEA = root mean square error of approximation, should be below 0.08; RMSEA 90 %CI = 90 % confidence interval of RMSEA; SRMR=standardized root mean square residual, should be below 0.05; Mod→Δ = Regression weight lambda of the moderator Mindset, as a measure of how the critical life event influences change in each of the Big Five traits from T1 to T2; Mod→Δ *(p)*= significance of the moderator; $\mu\Delta$ = intercept of latent change score; $p(\mu\Delta)$ = significance of latent change score.

Appendix B

Curriculum Vitae

Jantje Hinrika DE VRIES

The curriculum vitae is not included in the online version for reasons of data protection.

APPENDIX B

The curriculum vitae is not included in the online version for reasons of data protection.

The curriculum vitae is not included in the online version for reasons of data protection.

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Selbstständigkeitserklärung

Hiermit erkläre ich, die vorliegende Dissertation selbstständig verfasst und ohne unerlaubte Hilfe angefertigt habe. Alle Hilfsmittel, die verwendet wurden, habe ich angegeben. Die Dissertation ist in keinem früheren Promotionsverfahren angenommen oder abgelehnt worden.

Berlin, den 22.03.2022

Jantje H. de Vries