



# Is the Association of Procrastination and Age Mediated by Fear of Failure?

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## Abstract

Procrastination as an intentional delay of personal tasks in spite of anticipating negative consequences as a result is a widespread behavior, particularly among young adults. Previous research points to a reduction of procrastinatory tendencies across the adult lifespan; it is unclear to date which mechanisms underlie this decrease of procrastination behavior. Given evidence of fear of failure strongly influencing younger adults to postpone the start or delay of intended actions, as well as a possible decrease of fear of failure with increasing age, this study set out to explore a potential mediating effect of fear of failure on procrastination. A total of 197 participants, aged 18 to 90 years, took part in this study via online questionnaires. Statistical analyses showed that procrastination behavior decreased across the adult lifespan. Higher levels of fear of failure were linked to more procrastination behavior. A mediation analysis indicated that the relationship between age and procrastination was mediated by fear of failure. Results are discussed in terms of theoretical and practical implications.

**Keywords** Procrastination · Aging · Lifespan · Fear of failure

## Introduction

Procrastination refers to the irrational behavior of delaying the start or completion of a task, even though this may result in negative long-term negative consequences (Steel, 2007). While procrastinating, the anticipated task is typically perceived as unpleasant or stressful and is deliberately postponed in order to engage in more pleasant activities, such as watching television (Pychyl et al., 2000), sleeping (Klingsieck,

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2013) or other leisure activities (Burka & Yuen, 1983). Prevalence rates of procrastination behavior are as high as 20–25% in the general population (Ferrari et al., 2007) and are estimated to range from 70 to 95% in college students (Steel, 2007). Most studies have investigated procrastination in young adults in the academic context (e.g., putting off performance-related tasks such as studying for exams at university; Grunschel et al., 2018; Katz et al., 2014; Klassen et al., 2008; Watson, 2001). There is, furthermore, evidence for procrastination behavior with regards to job hunting (Senécal & Guay, 2000), health-related behaviors (e.g., going for check-ups; Sirois, 2007), leisure activities (e.g., joining a sport group; Hen & Goroshit, 2018), tax filing (Kasper, 2004), or even saving for retirement (Topa & Herrador-Alcaide, 2016). These examples illustrate that procrastination behavior may be present across the entire (adult) lifespan; research so far, however, has almost exclusively focused on younger adults and has neglected how procrastinatory tendencies develop in older age. The present study set out to explore possible underlying factors that may influence procrastination behavior and its development across the adult lifespan.

There are numerous studies examining possible causes of procrastination. In a comprehensive meta-analysis comprising 216 studies and resulting in 691 correlations of different predictors of procrastination behavior, Steel (2007) linked specific personality traits (e.g., conscientiousness, neuroticism) to procrastination behavior. Lower conscientiousness was strongly related to more procrastination behavior, whereas other personality traits like neuroticism and agreeableness only showed weak correlations with individuals' tendencies to postpone the start or completion of intended actions (e.g., neuroticism showed a weak positive correlation and agreeableness showed a weak negative correlation with procrastination behavior; Steel, 2007). Some researchers consider procrastination to reflect a deficit in self-regulation (Balkis & Duru, 2016; Zhang et al., 2018); which may be linked to both impulsiveness as well as perfectionist tendencies (cf. a meta-analysis, Sirois et al., 2017). In fact, increased procrastination behavior seems to be associated with feelings of lower self-efficacy and high impulsiveness. Moreover, there is evidence that task characteristics and reward delay may also influence procrastination behavior. More difficult or more aversive tasks tend to be more often postponed than less difficult and less aversive ones; the longer individuals have to wait for their reward for working on an unpleasant activity (e.g., studying for an exam now, but only graduating in 2 years), the more likely they are to procrastinate (Steel, 2007). Taken together, procrastination behavior seems to result from a complex interplay of cognitive, motivational and affective factors which differ inter-individually and may interact with each other (Pychyl & Flett, 2012).

Studies indicate that procrastination behavior may be more prevalent in younger adults than in older adults, suggesting a reduction in procrastination behavior across the adult lifespan (Beutel et al., 2016; Hen & Goroshit, 2018; Steel & Ferrari, 2013). In Steel's (2007) meta-analysis a strong negative relationship between age and procrastination was found, indicating decreasing procrastination behavior with increasing age. This observation was supported by subsequent studies: Gröpel and Steel (2008) examined 9351 participants aged from 18 to 70 and reported a decrease of procrastination behavior with older age. Similarly, Steel and Ferrari (2013) observed reduced procrastination behavior with increasing age in a large sample of 16,413

participants (mean age=38.3). Consistently, Svartdal et al. (2016) examined 2893 participants (mean age students=24.03, mean age employees=37.44) and reported a decrease in procrastination behavior with age. Furthermore, Beutel et al. (2016) examined 2527 individuals aged 14–95 years and showed that procrastination behavior is highest in the younger age groups (14–29 years) and decreases with higher age.

Possible underlying mechanisms for this decreasing procrastination behavior in older age groups are largely unexplored. Some evidence suggests individuals procrastinate due to fear of failure, referring to the expectation of threat or aversive consequences in performance situations (Conroy et al., 2007). Individuals plagued by fear of failure believe they are incapable of completing a task to their own expectations (Kachgal et al., 2001), or that the demands placed on them are too high, and so they try to hide performance anxiety by postponing the beginning or completion of tasks (Ferrari, 2001; Haghbin et al., 2012). Studies examining younger adults in the academic field showed a positive relationship between procrastination behavior and fear of failure (Haghbin et al., 2012); hence, stronger fear of failure was associated with more procrastination behavior. Solomon and Rothblum (1984) found that fear of failure explained 49.4% of the variance of reasons given for procrastination; similarly, Haghbin et al. (2012) reported a positive relationship between fear of failure and academic procrastination in students who rated their own competencies as poor. Zhang and colleagues identified both a positive relationship between procrastination and fear of failure, as well as that fear of failure mediated the relationship between procrastination and self-worth.

In contrast, Schouwenburg (1992) reported no significant association between fear of failure and procrastination in students. Similarly, Steel's (2007) meta-analysis found only a weak relationship between procrastination and fear of failure. Thus, empirical evidence is somewhat mixed. Conceptual and methodological differences in the assessment of fear of failure, such as unidimensional constructs versus aggregated scores comprising various constructs or scales, may explain these inconsistent findings (Haghbin et al., 2012). Steel (2007) grouped fear of failure together with appraisal anxiety, social perfectionism, and self-esteem. This is to be noted, as Conroy et al. (2007) argued for fear of failure and perfectionism to be considered as distinct constructs that need to be assessed separately. Recent studies that used the multidimensional Performance Failure Appraisal Inventory (PFAI; Conroy et al., 2002) to measure fear of failure have reported a positive relationship between fear of failure and procrastination in academic settings (Haghbin et al., 2012; Zarrin et al., 2020; Zhang et al., 2018).

The relationship between fear of failure and procrastination has so far primarily been investigated in younger adults. Studies suggest that fear of failure already starts to develop in childhood between the age of 5 to 10 years (Atkinson, 1957). Conroy et al. (2007) examined 97 female athletes (aged 8–18) and reported higher fear of failure in older as compared to younger children. Fear of failure is highly prevalent in academic and achievement-related domains (Haghbin et al., 2012), such as at college (Solomon & Rothblum, 1984) or in competitive sports in young athletes (Conroy et al., 2007). Therefore, as adulthood progresses, the context and experience of fear of failure may change and possibly even decrease, indicating a need for further research

into the impact of fear of failure in young adults on different aspects of life, arguably particularly academically connotated areas.

Studies in younger adults have reported a negative association of fear of failure with self-esteem; hence, more fear of failure was related to lower self-esteem (Senécal et al., 1995; Steel, 2007; Zhang et al., 2018). Robins et al. (2002) found that self-esteem decreases in adolescence and young adulthood, gradually increases across middle and older adulthood, only to then decrease again in very old age. This increase in self-esteem in middle adulthood may be associated with reduced fear of failure and may contribute to the observed decline in procrastination behavior in older adults. Beutel et al. (2016) suggested that some of the factors associated with procrastination, such as anxiety, may be more prevalent in younger age groups and may contribute to their increased procrastination behavior. Haghbin et al. (2012) reported a positive relationship between procrastination and fear of failure in students who rated their own competencies as poor. Subjective competence increases with older age (Roberts et al., 2006), and may therefore also influence the development of procrastination and fear of failure across the lifespan. Furthermore, students suffering from fear of failure sometimes experience their tasks as aversive and beyond their abilities (Blunt & Pychyl, 2000; Haghbin et al., 2012). An older person with more work experience and a steady job with recurring tasks and activities may feel less overwhelmed or “challenged” by their tasks than students. Similarly, educational programs at universities may require more independent organization and scheduling of timetables, whereas, work schedules typically provide a set time frame and daily schedule which may reduce procrastination behavior (Beutel et al., 2016) as well as influence the experience of fear of failure.

The goals of the present study were: To investigate the development of procrastination behavior and fear of failure across the adult lifespan, and, furthermore, to explore the possibly mediating effect of fear of failure on procrastination. Using two questionnaires, participants were asked to rate their procrastination behavior and fear of failure. In addition, real-life procrastination behavior was assessed using a diary task adapted from Altgassen et al. (2019); during said task, participants were asked to state five intentions they intend to execute within the next three days. After three days participants were contacted again to assess whether or not intentions were completed.

The present study examined the following hypotheses:

1. In line with previous studies (Beutel et al., 2016; Steel, 2007; Hen & Goroshit, 2018; Steel & Ferrari, 2013), we expected a decline of procrastination behavior across the adult lifespan.
2. Given the observed increase in self-esteem across the adult lifespan, we expect a decrease of fear of failure with increasing age.
3. Given evidence in younger adults (Haghbin et al., 2012; Zarrin et al., 2020; Zhang et al., 2018), we predicted the relationship between age and procrastination to be (partially) mediated by fear of failure.

## Methods

### Participants

For the present study 244 participants were recruited; 47 participants were excluded due to incomplete data ( $N=46$ , not filling in the second part of the survey) and being minor ( $N=1$ ). Thus, the final sample consisted of 197 participants, comprising 54 men and 143 women with a median age of 24 years (18–90 years of age,  $SD=14.66$ ). Of these, 140 participants were aged 18–29 years, 27 participants were aged 30–49 years, and 30 participants were over 50 years. For an overview of the sample's demographic characteristics see Table 1. Sixteen participants reported clinical diagnoses of mental disorders: attention deficit (hyperactivity) disorder ( $N=3$ ), anxiety disorders ( $N=3$ ), depression ( $N=10$ ). Participants were recruited through the local university participant pool as well as word of mouth. The study was approved by the local ethics committee. Giving written informed consent was a critical inclusion criterion for the present study.

### Instruments

*Pure Procrastination Scale (PPS)*. The Pure Procrastination Scale (PPS) by Steel (2010) consists of 12 items and measures procrastination behavior. The PPS draws on several items from the General Procrastination Scale (GPS; Lay, 1986), the Decisional Procrastination Scale (DPS; Mann et al., 1997), and the Adult Inventory of Procrastination (AIP; McCown et al., 1989). Items are rated on a 5-point response scale, with higher scores indicating higher levels of procrastination. Items are distributed across three scales for procrastination behavior: (a) *Decisional* (b) *Implemental* and (c) *Timeliness/Lateness*. The *Decisional* scale is composed of items from the DPS (Mann et al., 1997), the *Implemental* scale of items from the GPS (Lay, 1986), and the *Timeliness/Lateness* scale of items from the AIP (McCown et al., 1989). The total score for Procrastination is the sum of the three subscales. For the present study, the translated German version of the questionnaire by Svartdal et al. (2016) was used. Reliability of the PPS in the present study was high (Cronbach's  $\alpha=0.81$ ).

*Performance Failure Appraisal Inventory (PFAI)*. The Performance Failure Appraisal Inventory (PFAI; Conroy et al., 2002) is a multidimensional instrument for assessing fear of failure. The items were translated from English into German and

**Table 1** Means (M) and standard deviations (SD) of the sociodemographic variables

|                              | General sample | 18–29 years  | 30–59 years  | <50 years    |
|------------------------------|----------------|--------------|--------------|--------------|
| <b>Age</b>                   | 31 (14.67)     | 23 (2.84)    | 38 (7.01)    | 61 (10.19)   |
| <b>Sex</b>                   |                |              |              |              |
| Female                       | 72.6%          | 78.6%        | 59.3%        | 56.7%        |
| Male                         | 27.4%          | 21.4%        | 40.7%        | 43.3%        |
| Education in years           | 12.34 (1.51)   | 12.19 (1.51) | 12.57 (0.97) | 12.83 (1.82) |
| Vocational training in years | 3.76 (2.8)     | 2.99 (2.07)  | 5.96 (4.12)  | 5.18 (2.66)  |

then each item was back-translated by two independent individuals. Subsequently, the back-translated items were forwarded to and revised by the author of the questionnaire, Prof. Conroy. On Prof. Conroy's recommendation, the negative wording of item 12 was changed (the word "not" was eliminated). The instrument consists of 25 items, which are answered on a 5-point response scale and distributed across five subscales: Fear of (a) *experiencing shame and embarrassment* (b) *devaluing one's self-esteem* (c) *having an uncertain future* (d) *important others losing interest* (e) *upsetting important others*. The total score for fear of failure (General Fear of Failure) is obtained by adding the scores of all subscales together. Higher scores represent a stronger expression of fear of failure. Reliability of the PFAI was high in this study (Cronbach's  $\alpha=0.82$ ).

*Diary Task.* The design of the diary task followed Altgassen et al. (2019). Participants were requested to write down five intentions that they planned to implement across the next three days. These intentions had to be task-based with a fixed date that were neither routine tasks nor already existing appointments. For each intention the following questions had to be answered (a) *How do you feel about the execution of your intention?* on a 5-point answer scale from (1) "very negative" to (5) "very positive" and (b) *How demanding do you consider the execution of your intention?*, (c) *How important is the execution of the intention for you?*, (d) *How confident are you that you will execute the intention?* on a 5-point answer scale from (1) "not at all" to (5) "very". After three days, participants were emailed a link to complete the second part of the survey. Here, the formed intentions were to be recalled first (*Recalled Intentions*); afterwards, each intention was shown one by one and the following questions had to be answered for each intention (e) *Did you carry out the intention?*, which was to be evaluated either with (1) "Yes, exactly as planned", (2) "Yes, at another time", (3) "Partially" or (4) "No, not at all". If the intention was only completed partially or not at all, participants were asked to state the reason for this (i.e., Why did you not (completely) execute the intention?). Completed intentions were composed of *Executed intentions (as planned)*, *Executed intentions (different time* [if they were completed at a different time than initially indicated]).

## Design and Procedure

The survey was conducted in the period from 15.01.2021 to 26.02.2021 via the online survey portal "SoSci Survey" (Leiner, 2019). First, information about the procedure and duration of the survey was displayed on the screen. Participants then were asked to enter their e-mail address, so that the link to the survey could be sent to them. Participants had to confirm that they were of legal age and were asked to give informed consent, otherwise the survey discontinued. Sociodemographic variables (e.g., age, gender, education, vocational training, and current occupation) as well as any diagnoses of psychological disorders were assessed. This was followed by the Pure Procrastination Scale (Steel, 2010) and the Performance Failure Appraisal Inventory (Conroy et al., 2002). Finally, the diary task was presented. After three days, participants received an e-mail asking them to participate in the second part of the study during which their memory for their intentions and their (non-)completion was assessed.

**Table 2** Means (M) and standard deviations (SD)

|  | General sample |
|--|----------------|
| <b>Procrastination</b>                       | 27.68 (9.09)   |
| Decisional                                   | 7.20 (2.67)    |
| Implemental                                  | 13.15 (4.75)   |
| Timeliness/Lateness                          | 7.33 (2.87)    |
| <b>Fear of failure</b>                       | 56.51 (16.14)  |
| Fear of experiencing shame and embarrassment | 18.45 (6.58)   |
| Fear of devaluing one's self estimate        | 9.89 (3.17)    |
| Fear of having an uncertain future           | 9.72 (3.54)    |
| Fear of important others losing interest     | 8.71 (3.39)    |
| Fear of upsetting important others           | 9.75 (3.64)    |
| <b>Recalled intentions (%)</b>               | 65.28 (33.02)  |
| <b>Executed intentions (%)</b>               |                |
| Executed intentions (correct time) (%)       | 45.15 (30.58)  |
| Executed intentions (different time) (%)     | 19.55 (22.80)  |

**Table 3** Correlations

|                                    | PPS     | PFAI    | Recalled intentions | Executed intentions (correct time) | Executed intentions (different time) |
|------------------------------------|---------|---------|---------------------|------------------------------------|--------------------------------------|
| Age                                | -0.19** | -0.26** | -0.07               | 0.09                               | -0.03                                |
| PPS                                |         | 0.38**  | -0.06               | -0.29**                            | 0.04                                 |
| PFAI                               |         |         | 0.06                | -0.11                              | 0.01                                 |
| Recalled intentions                |         |         |                     | 0.21**                             | 0.15*                                |
| Executed intentions (correct time) |         |         |                     |                                    | -0.39**                              |

Note. PPS=Pure Procrastination Scale, PFAI=Performance Failure Appraisal Inventory

\* $p < .05$ , \*\* $p < .01$

## Data Analyses

Data analysis was performed using SPSS statistical software, version 27 (IBM Corp., 2020). In a first step, correlational analyses were conducted between measures of procrastination, fear of failure as well as age, recalled and executed intentions. Subsequently, a mediation analysis with bootstrapping (following Hayes, 2013) was used to explore whether the relationship between age and procrastination was mediated by fear of failure.

## Results

Mean values and standard deviations of the variables procrastination, fear of failure as well as recalled and executed intentions can be taken from Table 2.

As indicated by Table 3, there was a negative correlation between age and procrastination and between age and fear of failure, indicating that increasing age was associated with reduced procrastination and reduced fear of failure. Procrastination

and fear of failure were positively related; thus, higher fear of failure was associated with more procrastination behavior. Recalled intentions showed no significant relationship with procrastination, age, or fear of failure. Executed intentions (correct time and total, but not different time) were significantly related to procrastination behavior. Higher reports of procrastination behavior were linked with fewer executed intentions. Age did not correlate with executed intentions.

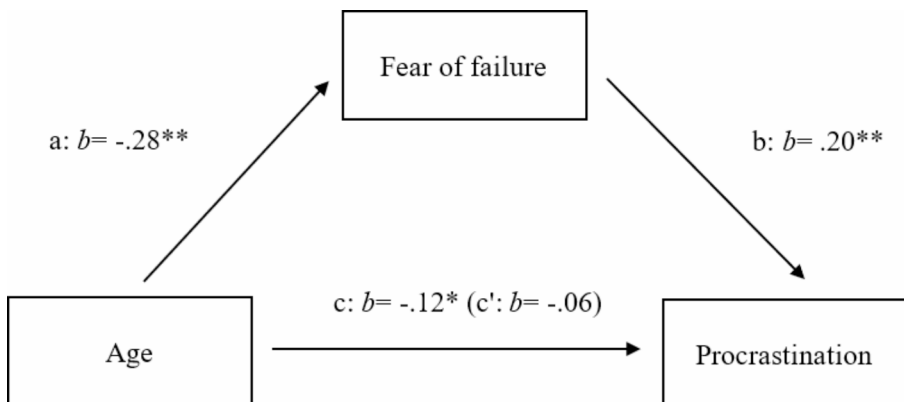
To assess the relationship between age and procrastination further, a mediation analysis with bootstrapping with fear of failure as the mediating variable was conducted. It was found that age significantly predicted both procrastination (path [c];  $a: b = -0.12$ ,  $t(195) = -2.73$ ,  $p = .007$ ) and fear of failure (path [a];  $a: b = -0.28$ ,  $t(195) = -3.68$ ,  $p < 0.001$ ). After including fear of failure into the model (path [b];  $b: b = 0.20$ ,  $t(194) = 5.11$ ,  $p < 0.001$ ), the direct effect between age and procrastination was found to be no longer significant (path [c'];  $c': b = -0.06$ ,  $t(194) = -1.50$ ,  $p = .134$ ). Thus, the relationship between age and procrastination was completely mediated by fear of failure. The indirect effect formed by paths *a* and *b* was significant ( $ab: b = -0.06$ , 95% CI [-0.09, -0.03]; see Fig. 1).

## Discussion

The aim of the study was to investigate the impact of fear of failure on the relationship between age and procrastination. For this purpose, participants completed two self-report questionnaires assessing fear of failure and procrastination. Moreover, they were asked to indicate five real-life everyday intentions that they intended to complete across the next three days.

## Procrastination

As expected, self-reported procrastination behavior decreased with age. The present results are in line with previous studies showing a similar decline of procrastination



**Fig. 1** Mediating effect of fear of failure on the relationship between age and procrastination. *Note.* \*  $p < .01$ , \*\*  $p < .001$



behavior across the adult lifespan (e.g., Beutel et al., 2016; Gröpel & Steel, 2008; Steel & Ferrari, 2013; Svartdal et al., 2016). In terms of effect size, these results fit ( $r = -.20$ ) with those observed in previous studies; Gröpel and Steel (2008) reported a slightly larger correlation ( $r = -.31$ ). Steel (2007) initially also found a weak negative relationship of age and procrastination ( $r = -.15$ ), which increased after correcting for the range of values ( $r = -.48$ ); similarly, Steel and Ferrari (2013) observed a slightly lower negative correlation than in previous studies with  $r = -.14$ , which is comparable to the effect found in the present study and might be due to the applied procrastination questionnaire, given they used the Irrational Procrastination Scale (IPS; Steel, 2010) which is similar to and highly correlated with the PPS administered in the present study ( $r = .87$ ; Steel, 2010). Svartdal et al. (2016) similarly employed the IPS and found a negative correlation between age and procrastination; correlations ranged from  $r = -.02$  to  $r = -.23$ , the latter being comparable to the results of the present study.

A key difference between the different measures is that the IPS measures only irrational procrastination (Steel, 2010), while the PPS examines a broader scope of procrastination behavior (Svartdal & Steel, 2017); being comprised of items from the General Procrastination Scale (GPS; Lay, 1986), the Decisional Procrastination Scale (DPS; Mann et al., 1997), and the Adult Inventory of Procrastination (AIP; McCown et al., 1989). The PPS measures both voluntary and observed delay as part of a general dysfunctional construct (Steel, 2010). This allows for a more global measurement of procrastination with decisional (i.e., delaying the decision-making process towards initiating a task), implemental (i.e., delaying the initiation or completion of task execution) and timeliness (i.e., delayed execution of a task or needing more time than intended) facets. The present study is the first to investigate the relationship between age and procrastination with the PPS (Steel, 2010). Taken together, the effect that procrastination decreases with age seems to be relatively constant and was consistently found across different studies, including the present one.

## Fear of Failure

Regarding the second hypothesis, a negative correlation between age and fear of failure was established, as expected ( $r = -.26$ ). Previous studies into the developmental trajectory of fear failure tended to focus on childhood (Atkinson, 1957) and adolescence (Conroy et al., 2007). Given the relationship between fear of failure and self-esteem (Senécal et al., 1995; Steel, 2007; Zhang et al., 2018) as well as the observed increase in self-esteem post adolescence (Robins et al., 2002), a decrease in experienced fear of failure with age was expected and, ultimately, found.

## Mediation

Finally, we predicted a mediation effect of fear of failure on the relationship between procrastination and age. Consistent with previous evidence in younger adults (Hagbin et al., 2012), fear of failure was positively related to procrastination. This is the first study to show that this relationship is present across the entire adult lifespan. These results are also in line with previous studies exclusively testing younger adults

in the academic setting; Zhang et al. (2018) reported a comparable positive relationship between procrastination and fear of failure ( $r=.27$ ); Zarrin et al. (2020) found a significant positive relationship ( $r=.19$ ). The findings of the present study therefore further support the notion of higher levels of fear of failure being linked to more procrastination behaviors whilst expanding it across the entire adult lifespan.

Consistent with our hypothesis a complete mediation effect of fear of failure was found between age and procrastination. Previous studies that investigated fear of failure together with procrastination were limited to the academic setting and only included younger adults. This is the first study to show that decreases in fear of failure with increasing age may explain the observed decline in procrastination behavior across the adult lifespan.

### Executed Intentions

Importantly, the present study showed that higher self-reported procrastination behavior was reflected in fewer executed intentions of the Diary Task ( $r=-.24$ ). These results are consistent with previous studies that examined procrastination using this Diary Task. Altgassen et al. (2019) reported a similar but slightly stronger negative relationship ( $r=-.57$ ) between procrastination and the executed intentions, indicating that participants reporting more procrastination behavior less often completed their intended tasks. In contrast, the present study did not show a significant relationship between procrastination and recalled intentions, implying failure or success in merely remembering the intended tasks was not significantly related to procrastination behavior. This contradicts findings of Altgassen et al. (2019), which could be due to the fact that they examined procrastination among individuals with attention deficit hyperactivity disorder (ADHD) that have been associated with deficits in episodic memory. Surprisingly, no significant associations of fear of failure and the Diary Task were found which may be due to the fact that participants' intended actions were not necessarily performance-related and may have not elicited any fear of failure. Interestingly, when considering not only intentions that were executed at the planned time - as done in the analyses just reported, but also those that were executed at a different than the initially planned time, we observed no negative correlations between intentions executed at a different time and self-reported procrastination behaviour ( $r=.04$ ) as well as fear of failure ( $r=.01$ ). While acknowledging the lack of significance in these correlations, these findings may imply that executing intentions at a different time than initially planned is more common in individuals with higher procrastination behaviors.

### Limitations and Outlook

It should be noted that all data were collected cross-sectionally, thus we cannot exclude generational differences in addition to age effects. Furthermore, it could be argued that the open nature of the tasks assessed via the diary task allowed for participants to select tasks that potentially did not elicit a genuine fear of failure. Lastly, particularly when comparing our study to previous research into the relationship between age and procrastination (e.g., Beutel et al., 2016: 2527 participants; Gröpel

& Steel, 2008: 9351 participants; Steel & Ferrari, 2013: 16,413 participants; Svartdal et al., 2016: 2893 participants), it has to be noted that we recruited a significantly smaller sample size.

Future studies should aim for a broader assessment of procrastination behavior and the possible contributing factors leading to its decrease in older adulthood (e.g., differences in task characteristics of younger and older adults). To further explore the mediating effect of fear of failure found, future studies should investigate procrastination behavior across different life domains. Hen and Goroshit (2018) suggest that differences in age may also be due to adults not procrastinating less but simply procrastinating in other domains of life (e.g., spending leisure time or maintaining health behaviors, Hen & Goroshit, 2018). Other studies speculate that the decrease in procrastination and age is due to the work environment (Nguyen et al., 2013) or partnerships (Steel & Ferrari, 2013). Again, future studies should include fear of failure to further explore possible associations. It is likely that there are complex and multiple determinants responsible for the decrease in procrastination across the lifespan, but their interaction is not yet fully understood.

## Conclusion

Taken together, this study showed that procrastination behavior decreases with increasing age, confirming previous findings (Steel, 2007; Beutel et al., 2016). Furthermore, the present study confirmed earlier findings of a positive relationship between procrastination and fear of failure (Haghbin et al., 2012; Zhang et al., 2018). Most importantly, this study was the first to show a complete mediation effect of fear of failure on the relationship between age and procrastination. This finding not only has theoretical, but also important practical implications. If fear of failure indeed critically contributes to procrastination behavior, we should aim to reduce fear of failure, especially in younger adults (Haghbin et al., 2012). Possible interventions could be regularly giving feedback and positive reinforcement to participants' performance (Zhang et al., 2018) or acceptance commitment therapy or cognitive behavioral therapy (Scent & Boes, 2014; Wang et al., 2017).

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**Data Availability** The data generated and analysed during the current study are available from the corresponding author upon request.

## Declarations

**Authors' Contribution** All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Valerie Danne and Mareike Altgassen. The first draft of the manuscript was written by Valerie Danne and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Informed Consent** All participants were asked to give written informed consent; not giving written informed consent was an exclusion criterion for this study.

**Conflict of Interest** The authors have no potential conflicts of interest to report. No funds, grants, or other support was received in preparation of this manuscript. The authors declare they have no financial interests.

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