



When doubts take over: a longitudinal study on emerging disengagement in the PhD process

Aida Alisic¹ · Ruth Noppene¹ · Bettina S. Wiese¹

Accepted: 11 December 2023
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Abstract

The purpose of the present investigation is to shed light on the intraindividual (i.e., within-person) process of distancing from the goal of obtaining a PhD. Based on the motivational theory of action crisis, we assume that a lack of both individual (here: self-directed career management) and external (here: social support) resources may fuel doubts concerning PhD completion. An action crisis, in turn, is proposed to undermine the subsequent motivation to engage in proactive behavior and seek out social support. We analyzed five waves of longitudinal self-report data ($N_{T1}=2011$ PhD students, 61.7% men; half-year intervals) with the random-intercept cross-lagged panel model. This method allows to separate between-person from within-person effects. As expected, we found intraindividual increases in self-directed career management and perceived social support to reduce the development of an action crisis, and vice versa. Practical implications on how to avoid a loss spiral in the PhD process are discussed.

Keywords PhD dropout intent · Self-directed career management · Social support · Action crisis · Random-intercept cross-lagged panel model

Pursuing the goal of earning a doctorate is challenging. It is known that doctoral students are exposed to high levels of stress (Cornwall et al., 2019; Goller & Harteis, 2014; McCauley & Hinojosa, 2020). Previous studies have found them to have low emotional well-being (Wollast et al., 2023) and even an increased risk of mental illness, particularly depression (Levecque et al., 2017). Many students are dissatisfied, do not finish their dissertation on time, or even quit their PhD studies (van Rooij et al., 2021). Doctoral attrition, in turn, is problematic for universities and those who quit (Goller & Harteis, 2014). For universities,

Aida Alisic and Ruth Noppene¹ contributed equally to this paper.

✉ Ruth Noppene¹
noppene@psych.rwth-aachen.de

Aida Alisic
alisic@psych.rwth-aachen.de

Bettina S. Wiese
wiese@psych.rwth-aachen.de

¹ Institute of Psychology, RWTH Aachen University, Aachen, Germany

high dropout rates among doctoral students are likely to result in financial losses and delays in scientific progress. Supervisors of doctoral students who do not complete their work may be disappointed because they have invested time in young scholars who leave them with unfinished research projects. Most importantly, non-completers themselves may experience lowered self-esteem and negative emotions, such as embarrassment or anger—sometimes even for an extended period of time (Goller & Harteis, 2014; Willis & Carmichael, 2011). Given the importance of this topic, researchers have become interested in factors that contribute to PhD success or attrition. Clearly, attrition can be attributed to multiple factors, not just one. In terms of environmental influences, previous research has shown that factors such as a lack of funding opportunities and experiencing unethical research practices can jeopardize the successful completion of a doctorate (Horta et al., 2018). Among the individual and situational factors that promote successful completion, doctoral students' self-management behavior and social support networks proved to be relevant (e.g. Alisic & Wiese, 2022; Goller & Harteis, 2014). However, most of these studies, which focus either on individual or situational factors, are qualitative or cross-sectional in nature, while multi-wave longitudinal studies are rare (Jaksztat et al., 2021).

Qualitative and cross-sectional methodologies are not able to differentiate *interindividual* differences from *intraindividual* fluctuation. A hypothesis that accounts for *interindividual* differences would be that doctoral students who report more effective self-management or perceive a more supportive network compared to others are less likely to intend to drop out. In contrast, a hypothesis that accounts for *intraindividual* differences would state that an increase in a doctoral student's self-management or an increase in perceived social support predicts a decrease in the *same* person's intentions to drop out. If the goal is to study processes that occur *within* individuals, data must be analyzed at the *intraindividual* level to avoid an inconsistency between research questions and level of analysis (Curran et al., 2014; Hamaker, 2012; Keijsers & van Roekel, 2018).

Longitudinal data offer the possibility to distinguish stable *interindividual* differences from *intraindividual* effects—at least when combined with the use of adequate modeling approaches that allow for this differentiation (Keijsers & van Roekel, 2018). Another disadvantage of cross-sectional study designs is that it is not possible to test for reversed causation. Multi-wave studies, in contrast, in which each construct is repeatedly assessed, make it possible to test for reciprocal relationships and to examine whether (the lack of) self-management and perceived social support influence the development of dropout intentions, whether dropout intentions influence self-management and perceived social support, or whether this relationship is dynamic and reciprocal.

To date it is still unclear how PhD students' self-management and perceived social support operate in the *intraindividual* process of disengaging from the goal of obtaining a PhD. Both a theoretical grounding and empirical testing are needed. Therefore, in this study, we investigate the dynamic interplay between the consideration to quit the PhD, self-directed career management, and perceived social support based on the theory of action crisis (Brandstätter & Schüler, 2013). We believe that employing the psychological concept of action crisis fills a critical gap in the higher education literature, since it provides a theoretical framework for studying the *process* of disengagement from the goal to obtain a PhD. Scholars have highlighted the need to examine the “development of engagement in as well as disengagement from doctoral work” (Vekkaila et al., 2014, p. 49) and “dynamics of doctoral students' study paths” (Martinsuo & Turkulainen, 2011, p. 118). In contrast to research on student attrition, previous studies on PhD dropout often lack a theoretical framework (Jaksztat et al., 2021). Examining the *intraindividual* process of disengagement requires the use of appropriate theory, such as the motivational theory of action crisis. A

reasonable test of the theoretical predictions further requires examining the dynamics over time through repeated measures of the relevant constructs and using a modeling procedure that allows for the separation of between-person from within-person variance — and this is where our study comes in.

Theoretical framework: the action crisis

Theories of goal pursuit, such as the model of action phases (Achtziger & Gollwitzer, 2018; Heckhausen & Gollwitzer, 1987), sometimes also called the Rubicon model, postulate a sequence of tasks an individual has to deal with in the process of goal setting and pursuit. In this model, the Rubicon passage implies that an individual eventually adopts a volitional mindset that facilitates to override conflicting motivational tendencies. However, dealing with such conflicting motivational tendencies may be difficult and is not always successful, especially when struggles begin to accumulate.

Typically, giving up on a goal is not a binary decision but rather a multiphase process involving a conflict in which the individual vacillates between further persistence and abandoning the goal (Brandstätter et al., 2013; Klinger, 1975). This decisional conflict has been coined an *action crisis* by Brandstätter and Schüler (2013). Experiencing an action crisis means starting to doubt whether the goal can be achieved, becoming unsure of how to continue with goal pursuit, thinking about giving up, and procrastinating (Brandstätter & Schüler, 2013; Ghassemi et al., 2021). This situation is often encountered when individuals have experienced repeated setbacks during goal striving or identified severe obstacles that threaten goal achievement (Brandstätter et al., 2013; Ghassemi et al., 2021). Action crises are associated with negative affect, decreased life satisfaction over time, lower goal-related performance, and higher probability of dropout (Brandstätter et al., 2013; Herrmann & Brandstätter, 2015). Although an action crisis often results in goal disengagement, it can also be replaced by a revival of goal engagement (Ghassemi et al., 2021).

Lack of self-directed career management as an internal impediment to PhD completion

Self-directed career management refers to the extent to which individuals take an independent and active role in their professional development. It is a crucial component of the protean career orientation (Briscoe & Hall, 2006). Career self-management is especially required in highly autonomous work and career settings. There is high agreement that autonomy is a particularly characteristic feature of the academic work and career situation (Ortlieb & Weiss, 2018; Roach & Sauermann, 2010, 2017). Typically, PhD students are flexible in order to manage their work tasks (e.g., analyzing data, writing research papers). At the same time they are seen as responsible for their own career development. Autonomy is perceived as a highly motivating characteristic of academic careers, but it can also be challenging, particularly for young scholars (Dettmers & Bredehöft, 2020; Hall, 1996). Juggling competing demands, dedicating enough time to the PhD project, and dealing with setbacks require good self-management strategies. Accordingly, prior research has shown self-management competencies to be related to students' PhD intention and success (Alisic & Wiese, 2022; Gardner et al., 2007; Goller & Harteis, 2014).

Self-directed career management also comprises whether individuals attribute previous career success (or failure) to their own personal effort in contrast to luck or to guidance

from others (Ortlieb & Weiss, 2018). While at first glance, attributing failures to external causes may protect self-esteem, at second glance, the belief that one's efforts are making a difference increases the likelihood that a PhD student will persevere when faced with challenges (Bandura, 1991). In the doctoral phase, students have to learn how to cope with frustration and phases of stagnation (e.g., Devos et al., 2017; Lovitts, 2005). Experiments need to be repeated, research questions and methodology revised, and essays rewritten (Lovitts, 2008). Believing that one's own efforts will pay off and will eventually lead to (career) success should strengthen goal striving and counteract the onset of an action crisis with regard to the completion of the doctorate. In other words, a lack of self-directed career management may instigate the development of an action crisis.

Lack of social support as an external impediment to PhD completion

In addition to doctoral students' own agentic behavior, past research has pointed to the importance of social support for PhD completion (e.g., Devos et al., 2017). Social support can be defined as the perception or experience of being cared for by others and having people to rely on (see Sarason et al., 1983). The PhD advisor takes a central role within the social support network (Barnes & Austin, 2009). Lovitts (2001), for example, reasoned that the relationship between the advisor and the advisee "is probably the single most critical factor in determining who stays and who leaves" (p. 270). Recent research has shown the importance of social support. In a cross-sectional study of more than 900 doctoral students, Wollast et al. (2023) found that two dimensions of supervisor support were particularly important for the students' emotional well-being and the intention to continue in the doctoral program. These two dimensions relate to meeting the needs for structure (e.g., by communicating clear expectations about goals) and for autonomy (e.g., by providing opportunities to make choices). In addition to the supervisor, supportive relationships with other doctoral students were also shown to prevent PhD students' attrition (Golde, 2005). Bair and Haworth (2004) concluded that PhD completers have formed stronger relationships with their academic peers than non-completers. In a qualitative interview study by Goller and Harteis (2014), faculty members emphasized the requirement for doctoral students to disclose their difficulties and actively seek support from their supervisors. In the same vein, questionnaire studies found that successful PhD students reported greater support by their supervisors, faculty and peers than unsuccessful students (Litalien & Guay, 2015; Martinsuo & Turkulainen, 2011). Accordingly, we assume that a lack of social support is perceived as a threat to the achievement of the PhD and can lead to an action crisis.

Reciprocal relationships between an action crisis in the goal of completing a PhD, self-directed career management, and social support

As argued above, decreases in self-directed career management and perceived social support are expected to fuel the occurrence of an action crisis in PhD students, as indicated by serious doubts concerning goal achievement and the impulse to drop out. However, the reverse might also hold true: An action crisis might deteriorate the building and maintenance of individual and social resource that are relevant for successful goals pursuit and completion. Typically, the development of an action crisis is preceded by repeated failures and difficulties in goal striving (Brandstätter et al., 2013). Reflecting on these setbacks while experiencing an action crisis might not only lead to doubts considering goal realization but also to questioning whether one's own efforts will make a difference.

Consequently, PhD students might perceive their careers as less controllable and behave less proactively. This might also include fewer attempts to seek social support.

The present research

Research context

Our research was conducted in Germany. Please note that compared to many Anglo-American countries, most German doctoral students are employed as research/teaching assistants and receive a salary and full social security benefits such as health insurance and pension plans. These positions often include teaching duties and involvement in different research projects, not all of which are related to the dissertation topic (Goller & Harteis, 2014). The thesis supervisor is usually also the doctoral student's line manager. In this most common constellation, doctoral studies are conducted on an individual basis; however, structured programs and doctoral opportunities financed by scholarships also exist. The employment contracts are usually limited in time. The maximum fixed-term period of 6 years is prescribed by law (i.e., The German Academic Fixed-Term Contracts Act/Wissenschaftszeitvertragsgesetz). Typically, however, the contract has a shorter duration than 6 years (e.g., 3 to 5 years), as this also depends on the duration and availability of research funding at a chair.

Research objectives

Regardless of national background, the literature points to the importance of self-directed career management and social support for PhD attrition. However, most of these studies were cross-sectional, or the results came from retrospective interviews with PhD advisors or PhD completers vs. non-completers (e.g., Owens et al., 2020; van Rooij et al., 2021). As stated earlier, none of these methods can be used to examine how these constructs develop over time and influence each other *within* an individual.

In our longitudinal study, we repeatedly asked PhD students to assess their self-directed career management, social support, and the experience of an action crisis regarding the goal of completing the PhD over a period of more than 2 years. This allowed us to test the hypotheses that an action crisis and (a) a lack of self-directed career management as well as (b) a lack of social support influence each other. Additionally, we explored if there were within-person relationships between self-directed career management and social support. We examined *within-person* stability and cross-lagged effects while controlling for between-person differences by using random-intercept cross-lagged modeling (RI-CLPM; Hamaker et al., 2015). Our hypothesized model is illustrated in Fig. 1.

Method

Research design and participants

Data were drawn from a larger project investigating career paths of early career scientists within the STEM fields which began in 2014 (see also Alisic & Wiese, 2020; Burk et al., 2016; Burk & Wiese, 2018a, 2018b; Claus et al., 2020; Frei & Grund, 2020; Lerche et al., 2022, 2023;

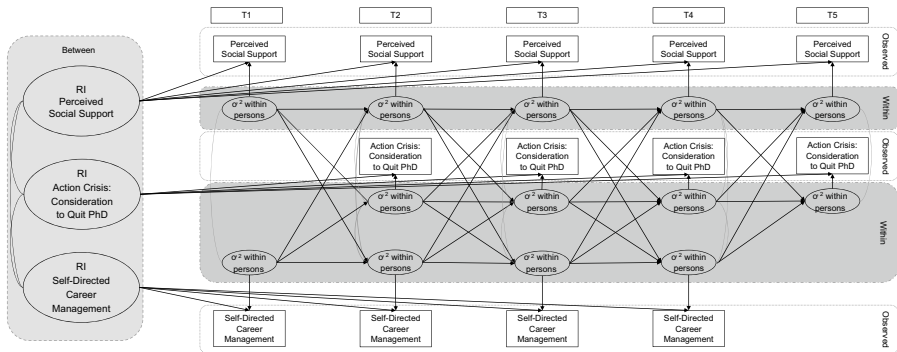


Fig. 1 Graphical illustration of the RI-CLPM. Note. Between = between-person variance; Within = within-person variance; Observed = observed variables

Noppeney et al., 2022a, 2022b). Participants were asked to complete a total of eight online questionnaires (T1 to T8) with approximately 6-month intervals which included information about their current career-related experiences (over a total time course of roughly 4 years). Additionally, they filled out an online questionnaire at study start, consisting of demographic information and stable personality measurements (T0). Regarding this study, we refer to T0 for the control variables (e.g., gender) and to T1 to T5 for the variables of interest.

Participants were recruited via mailing lists, internet platforms, web sites of universities, and other research institutes. While doctoral students as well doctorate holders were considered within the overall project, only those who were doctoral students at T1 were included in our study. If participants indicated the completion of their dissertation at any subsequent measurement point, they were not asked about their quitting intentions anymore. The final sample consisted of $N_{T1}=2011$ (61.7% men), and in the following — due to dropout — $N_{T2}=1616$, $N_{T3}=1282$, $N_{T4}=883$, and $N_{T5}=923$ doctoral students from the STEM fields (at T1, 41.4% worked in the field of natural sciences, 39.8% in engineering sciences, 8.6% in computer sciences, and 6.0% in mathematics). Within the considered time frame (T2 to T5), $n=554$ doctoral students finished their PhD. As an incentive, participants could choose to participate in a raffle winning up to 2000€ (~\$2.277 USD; T1 to T5).

Measures

All self-report items had to be rated on 6-point scales (1 = *strongly disagree* to 6 = *strongly agree*). Means, standard deviations, and Cronbach's alpha for each scale are reported in Table 1.

Perceived social support

Perceived social support was measured with three items adapted from the Mentor Role Instrument (MRI; Ragins & McFarlin, 1990; German version by Schneider, 2009): “In my work environment, there are people who suggest specific steps for achieving career goals”, “In my work environment, there are people who support and encourage me”, and “In my work environment, there are people who guide my professional development”.

Table 1 Descriptive information for all study variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 PSS T1	3.8	1.2	.79														
2 PSS T2	3.6	1.3	.61***	.81													
3 PSS T3	3.6	1.3	.55***	.64***	.80												
4 PSS T4	3.8	1.3	.43***	.49***	.60***	.85											
5 PSS T5	3.8	1.3	.32***	.35***	.43***	.46***	.85										
6 SCM T1	4.7	.82	.04	.02	.04	-.01	-.02	.66									
7 SCM T2	4.6	.84	-.02	-.00	-.01	.02	-.04	.53***	.69								
8 SCM T3	4.6	.85	-.03	-.00	-.01	-.01	-.04	.47***	.60***	.70							
9 SCM T4	4.6	.84	-.05	-.05	-.04	-.05	-.05	.44***	.56***	.59***	.71						
10 CiQ T2	1.8	1.2	-.16***	-.21***	-.19***	-.16***	-.06	-.10***	-.13***	-.11***	-.06	-					
11 CiQ T3	1.9	1.2	-.19***	-.23***	-.28***	-.23***	-.15***	-.08**	-.14***	-.13***	-.12**	.65***	-				
12 CiQ T4	1.9	1.2	-.07	-.08*	-.13**	-.19***	-.15**	-.07	-.09*	-.09*	-.12**	.50***	.57***	-			
13 CiQ T5	1.9	1.2	-.13**	-.12**	-.11*	-.16**	-.18***	-.07	-.10*	-.10*	-.08	.33***	.46***	.61***	-		
14 Age	29.9	3.1	-.08**	-.10***	-.12***	-.05	-.09**	-.00	-.03	-.07*	-.05	.06*	.06	.07	.09*	-	
15 Time	2.6	3.0	-.06*	-.08**	-.00	-.01	-.02	-.04	-.05*	-.03	.02	.01	.02	.04	.07	.32***	-
16 Gender	-	-	.00	.01	.02	-.06	-.01	-.01	-.04	-.00	.01	.04	.10**	.11**	.12**	.13***	-.04

PSS, Perceived Social Support; SCM, Self-directed Career Management; CiQ, Consideration to Quit PhD; Time, Time since start of PhD (in years); Gender = 0 = male, 1 = female; M = Mean; SD = Standard Deviation; Cronbach's Alpha for each scale is depicted on the diagonal (in bold)

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

Self-directed career management

Self-directed career management was measured by three items adapted from the self-directed career management subscale of the protean career attitudes scale (Briscoe et al., 2006). The three items were “In my career so far, I have relied more on myself than on others”, “Ultimately, I depend upon myself to move my career forward”, and “If I am not offered career opportunities, I seek them out on my own”.

Consideration to drop out of the PhD program

Following the approach of Brandstätter and Schüler (2013), the degree of an action crisis considering the goal of obtaining the PhD was measured with one item (“I am seriously considering dropping out of my PhD”). To validate the single-item measure, we included two additional items at T5. The three-item scale had an internal consistency of .80. The correlation of the single item and the three-item scale was $r = .85$. The correlations of the three-item scale with self-directed career management and social support ($r_{T1-T4} = -.13^{**}$ to $-.14^{**}$ and $r_{T1-T5} = -.09^*$ to $-.15^{**}$) were of comparable size to those using the single item shown in Table 1, supporting the validity of the single-item measure.

Control variables

As age was correlated with the consideration to quit the PhD, we included it as a control variable in our analyses. Since former studies have shown an association between gender and social support—such that women receive less social support than men (Castro et al., 2011)—we also included gender. Additionally, we included time since starting the PhD (in years) and discipline (divided into the four STEM categories) as time-invariant control-variables in our analysis, as both time and discipline have been associated with PhD completion in previous research (Horta et al., 2019; Skopek et al., 2022).

Dropout analyses

To assess selective dropout, we regressed the participation pattern (continuous participation vs. participation only at T1) on scores of self-directed career management, perceived social support, and intent to quit the PhD at T1 as well as on our control variables (one at a time). Individuals with complete cases ($n = 621$) showed higher self-directed career management ($M = 4.7$, $SD = 0.7$) than individuals who only participated at T1 ($n = 347$, $M = 4.6$, $SD = 0.9$). Additionally, individuals with complete cases were slightly younger ($M = 29.6$, $SD = 2.9$ vs. $M = 30.3$, $SD = 3.5$) and were less likely to have a degree in computer sciences (compared to other STEM-disciplines).

Analytical approach

Data was analyzed by specifying a RI-CLPM (Hamaker et al., 2015; Mulder & Hamaker, 2021) with a maximum likelihood estimator using the R package “lavaan” (Rosseel, 2012). Full information maximum-likelihood (FIML) estimation with robust standard

errors was used to handle missing values due to dropout (Graham, 2009). Typical of traditional cross-lagged panel models (CLPMs), RI-CLPM can be used for repeated measurement data where multiple measurement occasions are nested within individuals. Traditional CLPMs do not distinguish between-person variance from within-person variance. However, between-person differences may be different from within-person processes, and drawing conclusions from aggregated information regarding the individual can be highly misleading. Random intercepts are included within RI-CLPM to separate between-person from within-person variance. In doing so, this modeling approach allows to investigate the relationship among the constructs of interest via autoregressive and cross-lagged effects at the intraindividual level. For two variables x and y measured at multiple occasions t for an individual i , the RI-CLPM can be expressed as follows:

$$x_{it} = \mu_t + \kappa_i + p_{it}$$

$$y_{it} = \pi_t + \omega_i + q_{it}$$

where μ_t and π_t represent the group means. The terms κ_i and ω_i are the random intercepts representing individual stable deviations from the group means (i.e., stable between-person part). Finally, the terms p_{it} and q_{it} stand for individual temporal deviations from their expected scores (i.e., dynamic within-person part) which in turn are based on the group means and the random intercepts ($\mu_t + \kappa_i$ and $\pi_t + \omega_i$). The individual temporal deviations (p_{it} and q_{it}) include the autoregressive and cross-lagged parameters. While the autoregressive parameters represent the within-person carry-over effects from one occasion to another, the cross-lagged parameters indicate the extent to which deviations from an individual's expected score on one variable can predict deviations from the same person's expected score on the other variable, and vice versa (for a more in-depth discussion of the autoregressive and cross-lagged parameters, see Hamaker et al., 2015). The model fit was assessed by comparing several fit indices for each model: chi-square (χ^2), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and the standardized root mean squared residual (SRMR).

Results

Correlations for perceived social support, self-directed career management, consideration to quit doctoral studies, and the above control variables are reported in Table 1. If applicable, internal consistencies are also displayed in that table. Fit indices for alternative models are presented in Table 2. Within these alternative models, models with increasingly strict constraints on equality over time are being estimated. In Model 1, coefficients are freely estimated. In Model 2 (a–c), increasingly strict and parsimonious constraints for autoregressive paths are added. In Model 3 (a–f), constraints for cross-lagged paths are added. If possible, more parsimonious models are preferred. The final model is depicted in Fig. 2.

The random intercepts of the experience of an action crisis and of perceived social support were negatively related at the between-person level ($\beta = -0.15$, $p < .001$). This indicates that PhD students who had more doubts considering the completion of their PhD thesis, also reported less perceived social support across all measurement occasions. The between-person relationship between an action crisis and self-directed career management did not reach significance ($\beta = -0.03$, $p = 0.221$). Moreover, the association between the random intercepts of self-directed career management and perceived social support did not

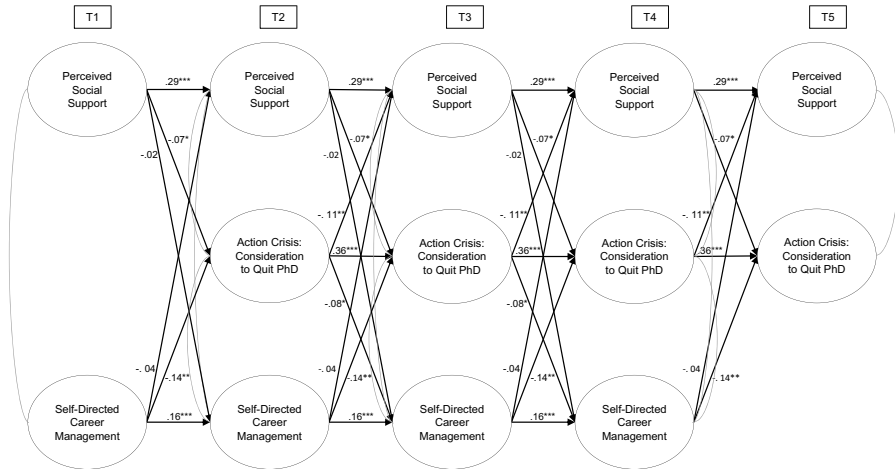
Table 2 Fit indices for alternative models

Variable	χ^2	df	TLI	CFI	RSMEA (90% CI)	SRMR
Model 1 (M1): RI-CLPM (full reciprocal model) with free structural coefficients	72.92***	31	.979	.992	.026 (.018-.034)	.024
Model 2 (M2): M1 + auto-regressive paths constrained						
Model 2a (M2a): M1 + CTQ paths constrained	74.97***	33	.980	.992	.025 (.018-.033)	.024
Model 2b (M2b): M2a + SCM paths constrained	82.28***	35	.979	.991	.026 (.019-.033)	.026
Model 2c (M2c): M2b + PSS paths constrained	89.32***	38	.979	.990	.026 (.019-.033)	.032
Model 3 (M3): M2c + cross-lagged paths constrained						
Model 3a (M3a): M2c + CTQ → SCM path constrained	89.50***	39	.980	.990	.025 (.018-.032)	.032
Model 3b (M3b): M3a + CTQ → PSS path constrained	89.96***	41	.982	.990	.024 (.018-.031)	.033
Model 3c (M3c): M3b + SCM → CTQ path constrained	95.07***	44	.982	.990	.024 (.017-.031)	.033
Model 3d (M3d): M3c + SCM → PSS path constrained	134.77***	67	.979	.986	.023 (.017-.028)	.031
Model 3e (M3e): M3d + PSS → CTQ path constrained	141.59***	70	.979	.986	.023 (.017-.028)	.033
Model 3f (M3f): M3e + PSS → SCM path constrained (final model)	142.92***	72	.980	.986	.022 (.017-.028)	.034

Control variables: age, gender, time since PhD start (in years), and discipline

CTQ consideration to quit PhD, SCM self-directed career management, PSS perceived social support, *df* degrees of freedom, TLI Tucker-Lewis index, CFI comparative fit index, RMSEA root mean square error of approximation, SRMR root mean square residual

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



Note. For clarity, only within-person changes are depicted. Control variables (i.e., age, gender, time since PhD start, and discipline) were included in the analyses but are not displayed here.

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

Fig. 2 Graphical illustration of the final model

reach significance ($\beta = -0.02, p = .433$). This suggests that individuals who perceive more social support compared to others are not necessarily those who perceive themselves as being more responsible for their career development. Analysis of the cross-lagged paths at the within-person level showed that an increase in both self-directed career management and perceived social support led to a reduced experience of an action crisis regarding the completion of the PhD (see Fig. 2 for within-person parameter estimates). In turn, an increased action crisis led to subsequent decreases in self-directed career management and perceived social support. Additionally, we tested whether the effects of social support and self-directed career management on action crisis (and vice versa) differed in magnitude. Results from Wald χ^2 tests showed that changes in social support and self-directed career management were comparably good predictors of an action crisis (Wald $\chi^2(1) = 1.50, p = .22$). The effects from changes in the experience of an action crisis on social support and self-directed career management were also of comparable sizes (Wald $\chi^2(1) = 0.24, p = .62$).

Discussion

In our study, we aimed at investigating the dynamic interplay of self-directed career management, perceived social support and the consideration to quit the PhD based on the theory of action crisis. Both self-directed career management and perceived social support helped students to continue pursuing the goal of obtaining a PhD, which, in turn, strengthened the view that career-development relies on one’s own actions and helped to seek out or, at least, perceive one’s surroundings to be supportive. In other words, both factors play a role in the development/prevention of doubts about graduation among PhD students. Similarly, the reciprocal effects were symmetrical: Increases in the consideration to quit the PhD were equally predictive of decreases in social support and self-directed career management. This pattern of results was consistent across all measurement points and did not vary between male and female PhD students. Considering the relationship of self-directed

career management and perceived social support, our results show that both constructs were neither related at the between-person nor the within-person level. This again underscores that both social support and self-directed career management are important for doctoral success and that it is not sufficient to invest in only one of these two resources.

Theoretical and methodological implications

Prior research has shown that perceiving low goal attainability increases the likelihood of an action crisis, which, in turn, leads individuals to distance themselves from their goals (Ghassemi et al., 2017). Our findings extend this view by showing that an action crisis is not only predicted by self-management deficits and a lack of social support, but also leads to decrements in these individual and social resources. In light of the fact that it is also possible to overcome an action crisis and reengage in goal striving, our results contribute to a better understanding of the psychosocial conditions that need to be addressed to help PhD students to renew their commitment and make efforts to reach their goals. Our research stands in contrast to a theoretical model which has been recently proposed by Milyavsky et al. (2022). The authors argue for a compensatory relationship between personal agency and social assistance. In our research, both self-directed career management and social support independently contributed to the *intraindividual* process of goal disengagement. Thus, results from our research speak to the fact that social support and personal agency are complementing rather than supplementing each other.

From a methodological point of view and corroborating other empirical studies (e.g., Ghassemi et al., 2021; Herrmann & Brandstätter, 2015), our findings highlight the importance of not drawing causal conclusions from cross-sectional data but to study processes with longitudinal data analyzed from a within-person perspective. We utilized the recently introduced RI-CLPM (Hamaker et al., 2015) that separates the within-person process from stable, between-person differences, thereby allowing a more precise investigation of the theoretical assumptions.

Strengths, limitations, and implications for future research

A clear strength of this study is the multi-wave longitudinal design that allowed for the analysis of dynamic relationships between the constructs of interest. We have shown that social support and self-directed career management are not only factors that are associated with entering an action crisis (here: to seriously consider quitting the PhD) across individuals but evolve in a reciprocal manner within persons. In fact, *intraindividual* changes in career goals and the individual perception of resources (career management and social support) can end in a gain or loss spiral. A perceived lack of social resources or control raises doubts about achieving the goal of a doctoral degree. These doubts, in turn, decrease viewing oneself as being in charge of one's own success and might lead to withdrawal from social partners in the academic setting.

However, our study is not without limitations. Our sample was limited to PhD students from STEM fields. Many of them have good career prospects outside academia that do not require a PhD. Future studies should, therefore, examine action crises among PhD students from other fields (e.g., social sciences and humanities). From an assessment point of view, we relied solely on a one-item measure to indicate the experience of an action crisis, although we validated this single item with a three-item scale at a later time point. Another limitation is that we did not distinguish different sources of social support within the work environment (supervisor/advisor, other faculty members, internal/external PhD

peers, the wider researcher community, etc.). Past research by Cornér et al. (2018) who employed a mixed-method approach (qualitative and between-person quantitative data) has pointed to the importance of investigating different sources of support (see also Litalien & Guay, 2015). Although the instrument that we used asked participants to think about social partners from their work environment, future research is needed to examine whether different effects emerge when explicitly asking to consider the support received by, for instance, the doctoral supervisor or peers. For example, based on longitudinal data from two waves (not separating between-person differences from within-person variability), Litalien and Guay (2015; Study 2) found no direct effect of supervisor support on changes in the intention to drop out, but found an indirect effect. In their study, supervisor support was positively associated with PhD students' perceived competence, which in turn predicted a decrease in the intention to drop out. Future research should also consider what kind of support (which might additionally interact with the source) is most valuable to doctoral students who have doubts about whether to continue their PhD (e.g., informational support, emotional support). Since our focus was to investigate the development of an action crisis, we looked at the consideration to quit the PhD. Future studies could expand this view by analyzing how and under which circumstances this action crisis leads to actual goal disengagement (i.e., dropout).

Further, our sample mostly comprises individuals working and living in Germany. One has to keep in mind that working conditions for many PhD students in Germany differ from other countries where the PhD is often seen as a post-gradual education embedded in a structured program designed for a group of PhD students. Results from German-speaking countries comparing different doctoral programs suggest that structured PhD programs reduce attrition rate (Brandt & Franz, 2020). This is also in line with investigations across Europe (Skopek et al., 2022). Most importantly, however, the interplay between self-directed career-management and the intent to quit the PhD and between social support and the intent to quit the PhD are suggested to be basic mechanisms that are not bound to country-specific conditions. But replications with doctoral students from other countries—including contexts where structured doctoral programs are more common—are highly warranted.

Clearly, an additional test of possible interaction effects of self-directed career management and perceived social support would be very interesting. However, estimation of a RI-CLPM with interaction effects often encounters estimation problems which is why we did not include them in our model. To still gain some insights on possible interaction effects, we investigated between-level interaction from self-directed career-management and social support at T1 on the intention to quit at T2. The interaction term did not reach significance ($\beta = 0.04$, $p = .214$).

The present study had its focus on psychological mechanisms as they unfold on the within-person level of PhD students. The within-person approach is an important complement to previous research. Still, it has to be kept in mind that doctoral attrition usually is a product of various factors. Hence, with this study, we do not want to question the great importance that environmental factors, such as funding opportunities, play in the PhD process.

Practical implications

The results of our study may deliver important insights for PhD students and universities. Facing obstacles during goal pursuit has shown to cause individuals to begin questioning successful goal attainment (Ghassemi et al., 2017). Since doctoral students often encounter

difficulties related to their research, experiencing an action crisis is not uncommon. We identified a negative feedback loop characterized by intense doubts, a low motivation to engage in self-management and decreasing feelings of being supported and encouraged. Knowing about this potential destructive mechanism could help to prevent doctoral students from PhD attrition and its negative consequences such as mental health impairments (Levecque et al., 2017). Fortunately, self-directed career management and seeking social support are changeable resources. Thus, it is important to recognize that the development of an action crisis can be counteracted by the strong belief that one is responsible for one's own career, and that there are people to whom one can turn if needed. It is of high relevance for young scholars to learn that (a) they are in charge of their career success and can build internal resources that help them to deal proactively with this demand and that (b) there is a support system (e.g., supervisor, peers) that they can consult. PhD students might profit from a training in self-management competencies, including the most adaptive ways to attribute past successes and failures and learn from both experiences. It is well-known that attributing success to one's own effort increases self-efficacy beliefs (e.g., Bandura, 1991). But what about setbacks and failure? At first sight, it seems beneficial to attribute them to external causes to prevent detrimental effects on self-esteem. At second sight, however, it makes sense to self-reflect on what one could have done better and how this informs future behavior in similar situations. This might enhance trust in successful goal achievement. Moreover, counselors and supervisors should be aware of how important it is for them to offer support to PhD students. They can also help students to set realistic (career) goals, thereby enhancing chances of goal achievement. Research further suggests that small successes (i.e., positive events) in goal striving may prevent the development of an (enduring or worsening) action crisis (Ghassemi et al., 2021). Supervisors should note that positive feedback has a strong influence on maintaining novices' motivation (Finkelstein & Fishbach, 2011). Therefore, when providing feedback to their students, they should not only focus on the things that need improvement, but also acknowledge what their students are already doing well.

Conclusion

In summary, our study sheds light on the interplay of social support, self-directed career management, and the consideration to quit the PhD. We expand previous research by taking an intraindividual developmental perspective. Our study highlights the importance of longitudinal multi-wave designs and modeling approaches that are capable of capturing reciprocal within-person processes. This approach deepens our understanding of how an action crisis develops and is manifested over time in an applied setting. From a practical point of view, we hope to have provided knowledge that might be used to develop interventions that prevent PhD students from being trapped into a loss spiral that keeps them from flourishing in an academic career.

Funding Open Access funding enabled and organized by Projekt DEAL. This research was made possible by grants to Bettina S. Wiese from the Federal Ministry of Education and Research (BMBF, grant numbers: 16FWN009 and 16FWN019). We gratefully acknowledge this support.

Declarations

Conflict of interest The authors declare no competing interests.

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