

Transition points: well-being and disciplinary identity in the first years of doctoral studies

Well-being and
disciplinary
identity

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Abstract

Purpose – The purpose of this study is to examine doctoral students' developmental trajectories in well-being and disciplinary identity during the first three years of doctoral study.

Design/methodology/approach – This study relies on data from a longitudinal study of PhD students enrolled at a large, research-intensive university in the USA. A group-based trajectory modeling approach is used to examine varying trajectories of well-being and disciplinary identity.

Findings – The authors find that students' physical health, mental health and disciplinary identity generally decline during the first few years of doctoral study. Despite this common downward trend, the results suggest that six different developmental trajectories exist. Students' backgrounds and levels of stress, psychological needs satisfaction, anticipatory socialization experiences and prior academic success predict group membership.

Originality/value – Although there is emergent evidence of a mental health crisis in graduate education scant evidence exists about the way in which well-being changes over time as students progress through their doctoral studies. There is also little evidence of how these changes might be related to academic processes such as the development of disciplinary identity. This study reported varying baseline degrees of well-being and disciplinary identity and offers that stress and unmet psychological needs might be partially responsible for varying trajectories.

Keywords Well-being, Motivation, Doctoral students, Stress, Disciplinary identity, Trajectory development

Paper type Research paper

Introduction

The early years of doctoral study are critically important moments in the development of scholars and researchers. Changing identities, emerging roles and new competencies are shaped on the transition from students to independent scholars (Lovitts, 2005). Although widely viewed as an important developmental period, evidence about this period is scant (Weidman *et al.*, 2001) and often inferred from theories about organizational transitions

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taking place in other settings (Kammeyer-Mueller *et al.*, 2012). Most importantly, examinations of this transition have paid little attention to the subject of well-being and mental health as it relates to other changing aspects of the doctoral experience. Estimates about the magnitude of the problem vary, but there is evidence that doctoral students' experiences are overtly stressful and might be leading to poorer mental health. Evans (2018), for example, estimates that graduate students are six times more likely than the general population to develop anxiety and depression. Leveque *et al.* (2017) arrive at a more conservative estimate by using a comparison group of highly educated adults in the population, but still conclude that graduate students have double the risk of developing mental health issues. Hunter and Devine (2016) estimate that more than one third of PhD students suffer from emotional exhaustion, and that this exhaustion is highly correlated with burnout and attrition from doctoral studies. Pyhältö *et al.* (2012) similarly find that 43% of the students in their sample expressed intention of wanting to withdraw and were more likely to experience heightened stress, anxiety and exhaustion. The assessment by Woolston (2017) that doctoral studies are a perilous journey converging quickly toward a crisis seems well supported by the literature.

In this paper, we make two contributions to the literature on doctoral education and student well-being. First, situated in the US context where coursework comprises the first few years of doctoral programs, we explore how students' well-being changes from the point of program entry into the early years of doctoral study. This is important because an early understanding of these trajectories and starting points might provide greater opportunity to design supportive environments and practices that help reduce negative mental health effects.

Second, we consider how well-being trajectories might be correlated to a main objective of the PhD, the development of disciplinary identity. The meaningful development of a disciplinary identity is associated with a multitude of positive outcomes, and thus our paper examines how well-being and disciplinary identity might develop together as students journey through the early stages of their degree. Research on doctoral education often focuses on single outcomes of interest rather than examining systems of variables that might be changing concurrently (Sverdik *et al.*, 2018). As such, we view our focus on multiple outcomes and trajectories and the system of explanatory variables that might predict these developments as positive improvements that contribute to a more nuanced understanding of how students experience graduate school in the early years.

Literature review and conceptual framework

Navigating the doctoral process is a journey full of stressors with many potential implications for well-being (Evans *et al.*, 2018; Hunter and Devine, 2016). These include work/research environments with little autonomy but high pressure to deliver, conflict with advisors and peers and unbalanced workloads that leave little time to focus on personal well-being (Cornwall *et al.*, 2019). The negative effects of stress can vary depending on a person's mental state and the intensity, duration and type of stressors (Cohen, 2000). Thus, perpetual exposure to the stressors without appropriate coping mechanisms can be harmful for maintaining good mental health and promoting physical health. Research has shown that stressors, including interpersonal conflict and lack of control and workload, are positively associated with various physical ailments (Bruk-Lee and Spector, 2006; Spector and Jex, 1998). The effects of stress on well-being are well documented (Fischer and Boer, 2011), but the evidence of the relationship between well-being and academic identity is more scant.

Disciplinary identity, the perceptions of membership to one's discipline, develops mainly through the pursuit of academic activities (Gardner, 2008; Weidman *et al.*, 2001) and engagement in research (Trujillo, 2007). We expect students' perceptions of disciplinary identity to shift as they engage in scholarly activities over the course of their studies. Although earlier works of socialization posited identity formation as a stage-oriented process (Bess, 1978; Thornton and Nardi, 1975), later literature suggests that identity develops across a set of interactive and concurrent states of socialization (Weidman, 2020). The literature suggests that identity develops across a discrete set of steps of a graduate socialization process: anticipatory, formal, informal and personal stages (Weidman *et al.*, 2001). Doctoral students develop their disciplinary identities even prior to starting their doctoral studies during anticipatory socialization and this helps a newcomer become part of a group and adjust smoothly (Austin and McDaniels, 2006). In the formal and informal stages of socialization, students learn more about the normative and informal roles expected to hold as members of the academic community (Weidman *et al.*, 2001). During the personal stage, students internalize the new roles and move toward being scholars with increased maturity and autonomy to conduct research independently (Austin and McDaniels, 2006). Here, the four stages reflect different states of identity that overlap rather than mutually exclusive moments in time (Weidman *et al.*, 2001, p. 11).

The concept of motivation might help explain how disciplinary identity and well-being are related. Under self-determination theory (SDT), the basic psychological needs for autonomy, relatedness and competence need to be fulfilled to develop an internalized identity. A higher sense of autonomy leads to a more integrated identity because this helps align inner goals and values with the work being pursued (Niemic and Ryan, 2009). Likewise, being a member of a disciplinary community involves a sense of commitment and identity that are created from internalizing the norms and rules valued in the discipline (Becher and Trowler, 2001). The fulfillment of the need for competence has been associated with the development of positive problem-solving competencies such as creativity and critical judgment (Wang and Berman, 2001).

These basic SDT needs also promote optimal health and well-being (Ryan and Deci, 2000). Sheldon *et al.* (1996) show that individuals who experienced greater fulfillment of autonomy and competence needs have less negative physical symptoms (i.e. headaches and difficulty sleeping). Further, Sheldon *et al.* (1996) find that autonomy is a key factor in mental health because individuals who lack control of their environment tend to develop maladaptive responses to stress. These findings have been validated across cultures (Church *et al.*, 2013) and across various settings (Williams *et al.*, 2014).

Given that SDT needs are highly correlated with internalization of identity and well-being, we predict that disciplinary identity and well-being develop in the same direction over the course of doctoral studies. Using cross-sectional survey data from an international sample dominated by the US students, Sverdlik and Hall (2020) find that students' levels of identity, well-being and motivation are lower in later phases of their doctoral programs. Specifically, their results indicate that intrinsic motivation is highest in the coursework phase and that doctoral students are more motivated by extrinsic motivators such as practical aspects of their degrees (i.e. finding a job and finishing their dissertation) or satisfying their supervisors in the dissertation phase. Consequently, doctoral students in the dissertation phase show the lowest level of identity integration despite the highest rating on self-efficacy in performing tasks associated with conducting research. Likewise, students' well-being is highest when they begin their programs and deteriorates as they progress over their doctoral program. This result may be because of the stressors (i.e. academic pressures and responsibilities, financial constraints and work-life balance) that are unique wellness

barriers to doctoral students that intensify over time (El-Ghoroury *et al.*, 2012). This downward trend found in a single cross-sectional study may not represent the general trajectory of the graduate student population but this reiterates the need for longitudinal research that discern phase-specific trajectories.

Literature provides further insight into how doctoral students' well-being and disciplinary identity development are influenced by their pre-socialization experiences and academic credentials. Doctoral students begin developing identities in their disciplines even before they enter their programs. Those who correctly anticipate the values, norms and behaviors that they need to hold in graduate school are more likely to be successful (Bess, 1978; Antony, 2002). In this sense, undergraduate research experience and a previous master's degree in the related field have been associated with higher levels of disciplinary knowledge and competencies necessary for conducting research (Luedke *et al.*, 2019; Flaster *et al.*, 2020). Other pre-socialization experiences, including attending conferences, presenting research findings and publishing, help individuals acquire research skills and form perceptions of the graduate student role (Gittens, 2014). Furthermore, recognition by meaningful others such as faculty members also influences identity development because a recognized individual is regarded as an accepted member of the academic community who possesses competence and knowledge to perform scientific practices (Carlone and Johnson, 2007).

Undergraduate grade point average (GPA) and Graduate Record Examination (GRE) scores are academic credentials that have been widely believed to be strong predictors of graduate student academic performance (Kuncel *et al.*, 2007). The selectivity of undergraduate institutions is also strongly related to advancement to graduate schools (Zhang, 2005). Research suggests that those who graduated from elite colleges are more likely to attend graduate schools at major research institutions (Eide *et al.*, 1998). These academic credentials may inform students' self-perceived academic knowledge and competence because their prior academic achievement provides feedback for students to develop their academic self-concepts (Flaster *et al.*, 2020).

We draw on this literature to make a set of predictions guiding our analysis. First, we recognize the changing nature of well-being and identity across the early stages of doctoral education and thus expect that the first three years of doctoral work will be associated with concurrent declines in mental health, physical health and disciplinary identity. We expect these trajectories will be a function of starting points and a set of varying environments and contexts different for each student. Second, we posit that stress, basic SDT needs, sociodemographics, anticipatory socialization experiences and prior academic credentials will be differentiating factors across these trajectory groupings. Our methods describe the approach we take to measuring these variables.

Methods

This study uses data from the Michigan Doctoral Experience Study beginning in Fall 2017 and ending in Fall 2019. This study surveys every incoming PhD student at a large, selective research-intensive public university in the Midwestern USA. The university enrolls more than 5,000 doctoral students across a host of disciplines. The survey is administered yearly to the incoming cohort and as a follow-up to existing cohorts. The current study contains data from students that began their doctoral studies in Fall 2017 and completed follow-up surveys in Fall 2018 and Fall 2019. We use data from participants with three years of data effectively narrowing our sample to 479 from a base population of 1,027 students (a 47% response rate). We report variations on this sample size, as it varies in specific analyses because of missing data or other technical issues.

Measures

The survey contains a variety of measures that track developmental progress and assess yearly milestones and activities as described below. Most critical to this study are the measures of well-being and stress, scales of SDT needs (Sheldon *et al.*, 1996) and a scale of disciplinary identity. The survey also contains questions about pre-socialization experiences prior to enrolling in the doctoral program. We draw demographics and prior academic achievement indicators from the university's institutional data.

We define well-being as perceived physical and mental health. To measure well-being, we use the self-rated health scale (Burström and Fredlund, 2001), a widely used 5-point scale for both mental and physical health that rates health from poor to excellent.

We define academic identity as the degree of perceived membership and socialization into one's professional discipline. Guided by Weidman *et al.* (2001) and Costello (2005), we developed a 3-item scale that assesses self-perceived membership and belonging within one's scholarly community. We provide the items developed, along with their Cronbach's alpha, in Appendix 1.

These three variables serve as our main set of outcome predictors and are used initially to derive membership profiles in our analysis. We also use a number of other variables to attempt to differentiate between these generated profiles. Those are described below.

To measure stress, we use the Perceived Stress Scale, an extensively validated 4-item targeted scale (Cohen *et al.*, 1983) that asks respondents to assess their stress levels in response to certain life situations. Higher scores indicate more stress.

To measure motivation, we rely on SDT (Ryan and Deci, 2000). SDT focuses on meeting individual's intrinsic needs across the areas of competence, connectedness and autonomy. We use a modified version of the Basic Psychological Need Satisfaction and Frustration scale (Chen *et al.*, 2015) to assess the three dimensions of SDT. Note that this scale measures the fulfillment of these needs as perceived by the individual.

To facilitate analysis, we create a set of factors out of the stress, motivation and academic identity constructs. The well-being constructs are not made into factors, as their scales are single-item scales.

Finally, we include academic pre-socialization and previous academic credentials as explanatory variables to account for different background experiences and levels of achievement. We use GRE scores and undergraduate GPA drawn from institutional data as controls for academic achievement. We also construct a ranking variable based on institutional ranking on the Times Higher Education (THE) World Rankings for the undergraduate institution attended by the student. We use this as a proxy for undergraduate institutional selectivity, as this might shape the student's prior experience and perceptions of knowledge and capabilities.

Analytical approach

As our interest lies in understanding the changing trajectories across our variables of interest, we use a group-based trajectory model (GBTM) analytical approach (Nagin, 2010). GBTM helps identify potentially similar developmental groups across time given a set of outcomes.

This approach yields a set of profiles that are sufficiently statistically different to merit inclusion in separate groups. These profiles are constructed from the outcome variables without any assumptions about group membership and without inclusion of any additional explanatory variables. We thus begin with a set of three outcomes capturing mental health, physical health and disciplinary identity. The initial purpose of our analysis is to derive a set of groups that captures concurrent trajectories across our three variables of interest. GBTM

is designed to handle longitudinal data and can thus account for differences in starting points across these variables. After identifying a set of viable groups, we turn our attention to investigating the critical characteristics that differentiate these groups. To do so, we first provide a set of descriptives to contextualize membership in the groups and follow this approach with a multinomial logistic regression model to predict group membership. We draw on variables identified in our literature review to make these predictions.

Results

Trajectory modeling

We run a set of models to identify common developmental trajectories in well-being (mental and physical health) and disciplinary identity. We select an ideal model by using fit statistics, group interpretability and group size (Suerken *et al.*, 2016; Nagin *et al.*, 2018). We rely on the Bayesian information criterion index (BIC) to assess model fit. A smaller BIC is associated with improved fit, and guidance indicates an incremental approach to group size with a stop point set once BIC is no longer improving. We derive a six group model (BIC = -5635.90) because adding a seventh group (BIC = -5630.89) does not substantially improve model fit and results in having multiple small groups that limit our ability to interpret membership.

The six group model trajectories are plotted in Figure 1. Among the 479 students who participated in the survey for three years, 20.4% are classified in the first group. We call this the “Continuing Struggle” group because their trajectories start low and decline fast over time. The trajectory of the second group (the largest group, 36.8%), which we label “Good not Great,” begins with an average baseline rating of well-being (roughly corresponding to “good” in the scales) and a moderate level of disciplinary identity. All variables slightly

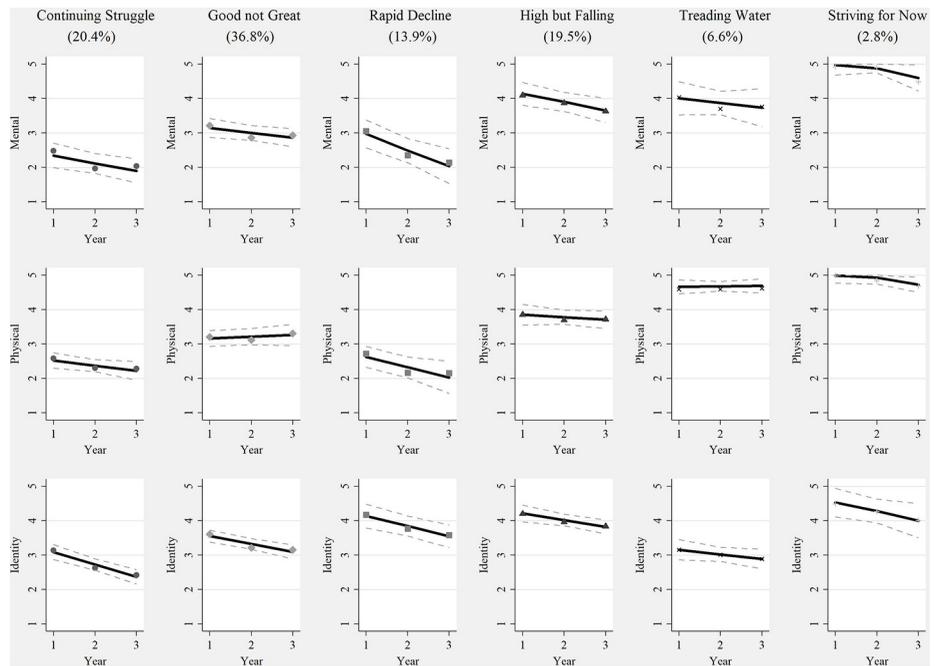


Figure 1.
Student development trajectories

decline over three years. The students of the third group, which we label the “Rapid Decline” group (13.9%), also have an average baseline well-being and a moderate level of disciplinary identity, but their ratings substantially decline over time.

The next three groups’ baseline levels are comparatively higher than the first three groups. Group 4 (“High but Falling”) makes up 19.5% of the population and begins with high baseline values across all three variables. Over time, their mental health and disciplinary identity decline. The trajectory of the fifth group (“Treading Water”, 6.6%) starts with high levels of mental and physical health and moderate levels of disciplinary identity. This group shows minimal change over the three-year period. The trajectory of the sixth group (“Thriving for Now”, 2.8%), starts at the highest levels of well-being and identity. This group’s well-being slightly decreases in the third year, whereas their disciplinary identity gradually declines over time.

Based on this analysis, we summarize the overall trajectories of well-being and disciplinary identity as declining. Although the magnitude of this decline seems dependent on starting point, the model sees no evidence of meaningful groups of students with positive trajectories. To be clear, this does not mean that our data do not contain students who might experience improving well-being and disciplinary identity. However, on average, our model characterizes the well-being and disciplinary identity of doctoral students as varying at starting points but fundamentally declining into year three.

Group characteristics

Having established a set of groups that describe the change of well-being and disciplinary identity over the first three years of doctoral education, we turn to describing these groups. [Table 1](#) presents descriptive statistics for each group. The first column presents the means/proportions and standard deviations for the full sample, whereas the following six columns show the statistics across groups. Overall, these results suggest notable differences in demographic characteristics and discipline types between the first three groups and the last three groups. The first three groups, which show downward trajectories with low starting points, have a disproportionate number of female, underrepresented minority (URM) and low-socioeconomic status (SES) students. In contrast, groups with high well-being, starting points have more male, non-URM and mid-to-high-SES students. Disciplines seem to clearly differentiate groups with students in the first three groups more likely to be in the social sciences and humanities, and students in the last three groups are more likely to be in science, technology, engineering and math (STEM) disciplines.

We find further differences in pre-socialization experiences and academic credentials across trajectory groups. The students in the “Continuing Struggle” group have, on average, fewer pre-socialization experiences, particularly pertaining to having a master’s degree in a related field, publishing and recognition from faculty members. This group is also composed of students with higher than average GRE scores. Students in the “Good not Great” group are more likely than the full sample to have earned a master’s degree or have joined a disciplinary organization and have higher undergraduate GPA and GRE verbal scores. The students in the third group, “Rapid Decline”, are more likely to have pre-socialization experiences (i.e. presentation, professional organization membership and recognition), but less likely to have attended highly ranked undergraduate institutions. The “High but Falling” group has the largest number of students with publishing experience and more recognition from faculty during previous degree programs. The “Treading Water” group is distinguishable from other groups for its

SGPE

Variable	Total	Group 1 (20.4%)	Group 2 (36.8%)	Group 3 (13.9%)	Group 4 (19.5%)	Group 5 (6.6%)	Group 6 (2.8%)
<i>Stress</i>							
Year 1	2.60 (0.871)	3.00 (0.865)	2.67 (0.868)	2.65 (0.744)	2.28 (0.872)	2.35 (0.921)	1.65 (0.625)
Year 2	2.75 (0.968)	3.34 (0.949)	2.83 (0.806)	3.06 (0.887)	2.24 (0.860)	2.08 (0.872)	1.73 (0.633)
Year 3	2.69 (0.773)	3.16 (0.731)	2.65 (0.628)	3.10 (0.744)	2.26 (0.690)	2.16 (0.635)	1.75 (0.733)
<i>SDT Needs</i>							
Year 1	3.94 (0.528)	3.51 (0.544)	3.87 (0.464)	4.01 (0.352)	4.30 (0.404)	3.93 (0.560)	4.68 (0.288)
Year 2	3.72 (0.694)	3.05 (0.610)	3.72 (0.554)	3.81 (0.651)	4.22 (0.504)	3.86 (0.490)	4.76 (0.305)
Year 3	3.68 (0.689)	3.05 (0.724)	3.71 (0.508)	3.60 (0.561)	4.18 (0.429)	3.82 (0.608)	4.50 (0.439)
<i>Demographics</i>							
Female	0.47 (0.499)	0.62 (0.487)	0.63 (0.483)	0.58 (0.497)	0.42 (0.497)	0.33 (0.479)	0.15 (0.376)
Age	27.06 (3.758)	27.24 (4.497)	27.10 (3.649)	27.17 (3.578)	26.96 (3.663)	26.93 (2.912)	25.77 (2.488)
USPR	0.64 (0.481)	0.72 (0.451)	0.68 (0.466)	0.72 (0.451)	0.57 (0.498)	0.73 (0.450)	0.69 (0.480)
URM	0.15 (0.357)	0.15 (0.359)	0.11 (0.317)	0.26 (0.443)	0.18 (0.382)	0.07 (0.254)	0.00 (0)
Low SES	0.20 (0.401)	0.18 (0.381)	0.22 (0.416)	0.31 (0.465)	0.25 (0.434)	0.13 (0.346)	0.00 (0)
<i>Discipline type</i>							
<i>Division</i>							
Bio and Health	0.23 (0.421)	0.15 (0.359)	0.25 (0.433)	0.25 (0.434)	0.35 (0.480)	0.13 (0.346)	0.23 (0.439)
Phys and Engin.	0.46 (0.499)	0.40 (0.492)	0.42 (0.496)	0.42 (0.497)	0.48 (0.502)	0.60 (0.498)	0.69 (0.480)
Social Sciences	0.22 (0.414)	0.32 (0.468)	0.26 (0.440)	0.25 (0.434)	0.12 (0.331)	0.20 (0.407)	0.08 (0.277)
Humanities	0.09 (0.286)	0.12 (0.327)	0.07 (0.252)	0.09 (0.292)	0.04 (0.200)	0.07 (0.254)	0.00 (0)
<i>Pre-socialization</i>							
MA degree	0.41 (0.492)	0.35 (0.477)	0.48 (0.501)	0.37 (0.485)	0.41 (0.494)	0.33 (0.479)	0.27 (0.467)
Research experience	0.89 (0.317)	0.83 (0.375)	0.88 (0.325)	0.88 (0.331)	0.97 (0.174)	0.87 (0.346)	1.00 (0)
Professional practice	0.47 (0.499)	0.41 (0.492)	0.48 (0.501)	0.56 (0.500)	0.43 (0.498)	0.47 (0.507)	0.33 (0.492)
Presentation	0.45 (0.497)	0.44 (0.498)	0.47 (0.501)	0.60 (0.494)	0.55 (0.500)	0.17 (0.379)	0.54 (0.519)
Publication	0.40 (0.490)	0.33 (0.472)	0.47 (0.500)	0.42 (0.497)	0.56 (0.499)	0.17 (0.379)	0.38 (0.506)
Membership	0.43 (0.495)	0.43 (0.497)	0.51 (0.501)	0.57 (0.499)	0.47 (0.502)	0.27 (0.450)	0.54 (0.519)
Recognition	3.15 (0.621)	2.85 (0.682)	3.15 (0.559)	3.27 (0.617)	3.40 (0.522)	2.82 (0.749)	3.52 (0.459)
<i>Academic credentials</i>							
Undergraduate GPA	3.67 (0.296)	3.67 (0.282)	3.74 (0.243)	3.60 (0.327)	3.68 (0.293)	3.82 (0.162)	3.67 (0.172)
<i>GRE verbal quantile</i>							
1st (lowest)	0.03 (0.161)	0.00 (0)	0.01 (0.109)	0.05 (0.216)	0.03 (0.178)	0.00 (0)	0.08 (0.277)
2nd	0.11 (0.310)	0.03 (0.177)	0.10 (0.303)	0.06 (0.248)	0.17 (0.379)	0.04 (0.192)	0.15 (0.376)
3rd	0.32 (0.467)	0.27 (0.444)	0.30 (0.459)	0.48 (0.504)	0.39 (0.490)	0.19 (0.396)	0.15 (0.376)
4th	0.54 (0.498)	0.70 (0.460)	0.59 (0.494)	0.40 (0.495)	0.41 (0.494)	0.78 (0.424)	0.62 (0.506)
<i>GRE Math quantile</i>							
1st (lowest)	0.04 (0.187)	0.06 (0.246)	0.03 (0.171)	0.05 (0.216)	0.02 (0.146)	0.00 (0)	0.00 (0)
2nd	0.09 (0.282)	0.09 (0.281)	0.09 (0.287)	0.13 (0.338)	0.09 (0.282)	0.04 (0.192)	0.08 (0.277)
3rd	0.22 (0.415)	0.20 (0.404)	0.22 (0.412)	0.35 (0.482)	0.22 (0.413)	0.15 (0.362)	0.31 (0.480)
4th	0.66 (0.475)	0.65 (0.479)	0.66 (0.474)	0.47 (0.503)	0.68 (0.470)	0.81 (0.396)	0.62 (0.506)
<i>Undergraduate institution ranking</i>							
Not in top 200	0.57 (0.495)	0.58 (0.495)	0.56 (0.497)	0.65 (0.482)	0.56 (0.499)	0.47 (0.507)	0.54 (0.519)
Top 200–51	0.17 (0.379)	0.20 (0.402)	0.18 (0.386)	0.15 (0.364)	0.20 (0.399)	0.20 (0.407)	0.23 (0.439)
Top 50	0.25 (0.434)	0.22 (0.416)	0.25 (0.437)	0.20 (0.403)	0.25 (0.434)	0.33 (0.479)	0.23 (0.439)
N	481	99	177	65	97	30	13

Table 1.

Descriptive statistics **Notes:** Mean coefficients; SD in parentheses

disproportionately small number of students with pre-socialization experiences. Students of this group reported the least experience of scholarly activities related to presentation, publishing a paper and holding a membership of an academic society. However, they have the highest incoming academic credentials. Even students classified in “Striving for

Now” group have prior research experience with high recognition from faculty during previous degree programs, but most of them do not have a master’s degree or previous professional experience.

Predictors of group membership

To better differentiate characteristics of membership for each group we perform a multinomial logistic regression to predict group membership using the aforementioned set of described variables. We exclude group six from this analysis because of its small sample size ($n = 16$). We provide average marginal effects (AME) in [Table 2](#). The AME is the average change in the predicted probability of the outcome when an independent variable changes by a unit, holding other factors constant ([Rodriguez et al., 2018](#)).

We use both year 1 (baseline) and a change from year one to three (delta) of stress and SDT needs to explain how the students’ starting point and development in these factors are associated with membership in a group. The results suggest that even after accounting for demographics, pre-socialization and academic credentials, stress and SDT needs affect well-being and disciplinary identity. The groups with downward trajectories and low baselines in mental and physical health are more likely to have higher stress baselines and changes to stress over time. For each one point increase in the stress scale at the start of doctoral study, students’ probability of being in the “Rapid Decline” group increase by 7.5% points. Further, for each one-point increase in stress over time within the study period, students’ probability of being in the “Rapid Decline” group increase by 7.6% points.

In contrast, students with lower stress baseline and stress change are more likely to be in the groups with more favorable trajectories. A one-point change in baseline stress predicts a respective 6.7% and 5.1% point higher probability of membership in the “High but Falling” and “Treading Water” groups. Likewise, SDT needs predict membership in the “Continuing Struggle,” “Good not Great” and “High but Falling” groups. Student with lower baseline stress and smaller change in stress are more likely be in these groups. However, those with higher SDT needs satisfaction upon entering the doctoral program and positive development in three years years are more likely to be in the “High but Falling” group.

Student demographic characteristics, discipline type, pre-socialization and academic credentials are also significant predictors of group membership. Male students and students in STEM fields are more likely to be part of the high well-being groups. One marked difference between these groups is found in pre-socialization experiences. Students with a publication record before doctoral studies are more likely to be in the “High but Falling” group, whereas those who have not published prior but have a higher undergraduate GPA score were more likely to be in the “Treading Water” group.

Discussion

In the US context, the first few years of doctoral study introduces many challenges for aspiring scholars. We contribute to the scant body of knowledge about this transitional period by examining longitudinal student-level data on mental and physical health, disciplinary identity, stress levels and psychological needs satisfaction. We do this by using group-based trajectory modeling to identify trends in students’ development and then identify the qualities that differentiate these groups using descriptive statistics. Finally, we use multinomial logistic regression to model the main predictors of membership in each group.

Several of our findings bear further discussion. Most notably, the trajectory models indicate that the first few years of doctoral program attendance are associated with stagnancy or declines in well-being and disciplinary identity into the first three years of

Table 2.
Average marginal
effects for five
trajectory groups

Variables	Continuing Struggle (1) M.E. (SE)	Good not Great (2) M.E. (SE)	Rapid Decline (3) M.E. (SE)	High but Falling (4) M.E. (SE)	Treading Water (5) M.E. (SE)
<i>Stress</i>					
Year 1 (base)	0.0818* (2.63)	-0.0385 (-0.88)	0.0746** (2.66)	-0.0665* (-2.12)	-0.0513* (-2.39)
Delta (year 3-year 1)	0.0491 (1.78)	-0.0370 (-0.96)	0.0763* (3.08)	-0.0359 (-1.30)	-0.0525* (-2.40)
<i>SDT needs</i>					
Year 1 (base)	-0.259*** (-6.55)	-0.136* (-2.29)	0.00635 (0.16)	0.390*** (8.00)	-0.00178 (-0.05)
Delta (year 3-year 1)	-0.142*** (-4.90)	-0.0334 (-0.72)	-0.0363 (-1.33)	0.215*** (5.54)	-0.00359 (-0.14)
<i>Demographic characteristics</i>					
Female	0.00988 (0.26)	0.114* (2.22)	0.00972 (0.26)	-0.0806* (-2.15)	-0.0532* (-2.07)
Age	-0.00240 (-0.38)	-0.00546 (-0.64)	-0.00258 (-0.46)	0.00247 (0.41)	0.00798 (1.92)
International (Ref. USPR Non-URM)	0.0237 (0.49)	-0.0651 (-1.02)	-0.0420 (-1.04)	0.0704 (1.51)	0.0130 (0.35)
USPR URM (Ref. USPR Non-URM)	-0.0276 (-0.52)	-0.104 (-1.40)	0.0766 (1.27)	0.0852 (1.52)	-0.0300 (-0.96)
Low SES	-0.0686 (-1.68)	0.0826 (1.35)	0.0547 (1.19)	-0.0314 (-0.77)	-0.0373 (-1.41)
<i>Discipline type</i>					
<i>Division (Ref. Humanities and the Arts)</i>					
Bio and Health Sciences	-0.141 (-1.45)	0.0471 (0.43)	-0.123 (-1.18)	0.171* (2.47)	0.0456 (1.35)
Phys Sci and Engineering	-0.0976 (-0.94)	0.0385 (0.33)	-0.0919 (-0.83)	0.0643 (0.93)	0.0867* (2.68)
Social Sciences	-0.0804 (-0.88)	0.0864 (0.83)	-0.0649 (-0.66)	0.0268 (0.42)	0.0321 (1.26)
<i>Pre-socialization</i>					
MA degree	0.0105 (0.25)	0.0915 (1.58)	-0.0339 (-0.83)	-0.0269 (-0.62)	-0.0412 (-1.26)
Professional practice	-0.0271 (-0.73)	0.0155 (0.31)	0.0288 (0.81)	-0.0255 (-0.69)	0.00829 (0.32)
Published	-0.0213 (-0.56)	0.0316 (0.62)	-0.0163 (-0.46)	0.0798* (2.22)	-0.0738* (-2.34)
Recognition	-0.0733* (-2.63)	0.00670 (0.16)	0.0552 (1.87)	0.0447 (1.37)	-0.0333 (-1.53)
<i>Academic credentials</i>					
Undergraduate GPA	-0.196* (-2.57)	0.134 (1.27)	-0.166* (-2.67)	0.0441 (0.63)	0.184* (2.40)
GRE verbal score (10 %tile)	0.0304* (2.34)	-0.0193 (-1.26)	-0.0154 (-1.53)	-0.0138 (-1.35)	0.0181 (1.71)
GRE Math score (10 %tile)	-0.0071 (-0.59)	0.0080 (0.49)	0.0064 (0.59)	-0.0005 (-0.42)	-0.0023 (-0.23)
<i>Undergraduate institution ranking (Ref. Not in top 200)</i>					
Top 200-51	-0.0115 (-0.25)	0.0329 (0.52)	-0.0422 (-1.05)	0.00535 (0.12)	0.0154 (0.46)
Top 50	-0.0418 (-0.95)	-0.0256 (-0.41)	-0.00958 (-0.22)	0.0666 (1.44)	0.0103 (0.33)
Observations	383	383	383	383	383

Notes: *t* statistics in parentheses; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

study for this sample of students. This is true across disciplines, levels of pre-socialization and student characteristics. In an educational environment where there is ample variation in the day-to-day experiences of graduate students according to their advisors, coursework, assistantships and topics of study, it is dismaying that the common experience of doctoral study is one of waning health and lowered identification with their disciplines. The GBTMs did not identify a single distinct group of students who had an upward trajectory for their well-being and identity development.

Additionally, although our models characterize few people as thriving during graduate school, it is clear that female, URM and low-SES students are overrepresented in the groups whose decline in well-being are most precipitous. Students who identify as male and non-URM, and who study in STEM fields, are overrepresented in the groups that begin doctoral study with excellent mental health and have the smallest declines. These findings are consistent with qualitative studies on academic socialization processes that describe marginalizing doctoral experiences for women of color and other groups who are minoritized, particularly within STEM fields (Cabay *et al.*, 2018; Gay, 2004; Carter *et al.*, 2013; Williams *et al.*, 2018).

Our regression results suggest two factors play a key role in driving these downward trends: stress and unmet needs for autonomy, competence and relatedness. These mechanisms predict membership in all of the trajectory groups, singly or together. Once demographics and other factors are accounted for, high stress emerges as the almost sole determinant as to whether someone's trajectories are classified as "Rapid Decline" (Group 3). Being female, URM and low-SES are no longer associated with membership in this group. This means that these types of students are overrepresented in Group 3 due to the high levels of stress they are experiencing. Additionally, the strongest predictor of "Treading Water" (Group 4 – a group with minimal change in their trajectories) is having one's SDT needs met, although being female is negatively associated as well. Because the SDT scale used in this study asked students to think about conditions in their programs while assessing their perceptions of needs satisfaction, this result provides suggestive evidence that program interactions might have an enduring impact on students' sense of well-being and personal development. The persistence of female/male students differences in subjective assessments of well-being, even when stress and SDT needs are accounted for, is consistent with research in the health and psychological sciences that finds females often report poorer health and higher stress than males (Franks *et al.*, 2003 and Mallinckrodt and Leong, 1992).

After accounting for stress and SDT needs, we find that demographics, disciplines, pre-socialization experiences and academic credentials have an inconsistent and much attenuated role in predicting group membership. This suggests that stress and SDT needs are the primary drivers of students' well-being and identity development. This is good news for faculty and administrators who seek solutions to the mental health "crisis" besetting graduate education; because unlike demographics and pre-socialization experiences, these factors are malleable and at least somewhat within their power to control.

Implications

Implications for research

The results from this study are a first step in mapping how doctoral students' identities and well-being develop together in graduate school. Given that study respondents were engaged in coursework and preparation for qualifying exams – hallmarks of the first few years of doctoral study in the USA – time pressure, uncertainty about program processes and role strain may be exacerbating their stress in this particular program phase (Cornwall *et al.*, 2019; Grady *et al.*, 2014). We should not assume that these early trends necessarily represent

the overall trajectory of well-being and identity development for doctoral study. Future research over a longer time horizon will allow scholars to discern if there are stage-specific trajectories associated with the periods of doctoral study that are hypothesized to exist but are rarely empirically measured (Tinto, 1993). In other words, it remains to be seen whether students' trajectories continue to decline well into and beyond their third year of study, or – hopefully – whether they begin to rise as more students enter the candidacy stage of their programs. And although the direction of students' trajectories hardly vary (they are almost all downward), the magnitudes of their trajectories do. Future research could take a mixed methods approach to collect rich data on the lived experiences of students in each of the trajectory groups to better understand the specific challenges they face.

It is rare to have longitudinal data on doctoral students that includes repeated measures of psychosocial factors related to well-being, identity development and motivation. Therefore, it is important to note that the students we studied attend a well-resourced, selective, predominantly white institution with high research productivity and a graduate school that has a large staff devoted to student programming. We wonder: What would trajectories look like at schools with fewer resources or a stronger emphasis on teaching or a more diverse student body – both in terms of social identities and academic preparation? Expanding the reach of this data beyond one institution would allow researchers to examine the generalizability of our findings and build more robust models of student development. Future research should examine these developments in a multi-institution sample of doctoral students.

Implications for practice

As of September 2019, nearly 95% of the students in the study population are still actively enrolled. In many institutions, the small number of students departing their programs might be used to make positive inferences about program success and environment. This stands in sharp contrast to our findings that suggest a highly stressful environment where mental health, well-being and notions of disciplinary membership worsen from year to year. To be fair, it is entirely plausible that these early trajectories are simply growing pains poised to improve after periods of transition are completed. This seems a fairly optimistic assessment given the observed trajectories and the knowledge that the next transition of doctoral work for most of these students will be characterized by pressures to develop further as independent researchers. This lack of attrition might be taken as feedback that things are working well, but administrators and faculty might gather better signals of early trouble by focusing on more holistic measures that assess not only summative outcomes but also the quality and pattern of the experience of various students as they go through their doctoral programs.

We hesitate to suggest more targeted interventions. Our paper explores initial trajectories but does not address specific mechanisms responsible for the patterns of change in well-being in this context. We posit, however, that a practical implication of this research might be that there are unknown risk factors that put students at a disadvantage long before they enter into their doctoral programs. Institutions working with limited resources must make choices about programs that target vulnerable student populations. Here they once again rely on proxies of risk and privilege choosing to target first-generation students or students from under-represented backgrounds. This approach has many merits but is inherently incomplete. Our analyses demonstrate that baseline levels of well-being and disciplinary identity are strongly correlated with more severe declines across these areas. Early interventions designed to identify and provide resources for these students might help fend off these steep early changes and give students more opportunity to create healthy routines and make fruitful adjustments to cope with the pressures of doctoral work.

Conclusion

The early phase of doctoral study is a critical transition point in the development of scholars, yet, empirically, we know so little about how students fare during this often challenging period. In this descriptive longitudinal study, we find that students who enter doctoral study with high levels of stress tend to fare the most poorly as they progress through their programs. Given the social ills of racism, sexism and classism, it is not surprising that students from marginalized backgrounds are overrepresented in groups that enter doctoral study with the highest levels of stress and lowest levels of their psychological needs being met. Because we worry that this finding may deter risk-averse faculty and administrators from admitting students from these backgrounds, it is important to highlight that almost all students in the study sample – regardless of background, stress and needs satisfaction levels – remained enrolled into the third year of doctoral study.

We also find that doctoral program attendance is often associated with declines in well-being and disciplinary identity over the first three years of study. We also provide evidence that stress and unmet SDT needs are key drivers of reduced well-being and disciplinary identities. Although not a direct focus of our study, it is logical to suspect that the conditions of doctoral study are responsible. Such conditions have been discussed widely in scholarly and administrative circles: low wages, isolation, anxiety about the academic job market, competition for scarce resources, lack of power – in other words, powerful and pervasive systemic issues that are not limited to a single institution (Cassuto, 2015; Nyquist and Woodford, 2000). We hope the results from this study help spark conversations among graduate program leaders as to how the conditions of doctoral study can be improved so that many more students – particularly those with minoritized social identities – can be described as thriving members of their academic communities.

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Further reading

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