Does Enjoyment, Guilt, and/or Rewards Motivate Faculty Research Productivity?

A Large-Scale Test of Self-determination Theory

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Abstract

What motivates faculty to be productive researchers is largely unknown as institutional, demographic, and social-environmental factors explain limited variance. The current study tested the extent to which self-determined motivation served as a predictor of university faculty member's research productivity. Analysis of a large-scale USA sample of 1,980 faculty from 21 institutions using structural equation modeling found autonomous motivation (enjoyment, value) positively related to self-reported research productivity and number of publications, beyond time spent on research. The basic needs of autonomy and competence predicted autonomous motivation, and indirectly predicted achievement. External motivation (rewards) had a relatively small positive relationship with research productivity, while introjected motivation (guilt) had no relationship. The results contribute to both the faculty development and motivation research literatures.

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Theoretical Framework and Objectives

The scholarly products of university professors make valuable contributions to society every day; for example, faculty research is a fundamental driver of scientific advancement, university-industry knowledge transfer, economic activity, and data-driven government decision-making (Landry et al., 2003; Perkmann et al., 2013; Weinberg et al., 2014). An NSF report stated university-based scientists generate the most publications and "conduct much of the most important and innovative research" (Javitz et al., 2010, p. 4), while concurrently training graduate student as the next generation of researchers. Despite the importance of faculty research, the number of articles published in the world's major peer-reviewed journals by USA faculty has plateaued while research expenditures continue to increase, suggesting less return on investment in research (Hill et al., 2007; Javitz et al., 2010; Litwin, 2014). Studies examining institutional (Bentley & Kyvik, 2013), demographic (Sugimoto et al., 2013), and social-environmental factors (Stupnisky et al., 2015) explain limited variance in faculty research outcomes.

Faculty motivation to conduct research stands out as a pivotal, yet understudied, factor in explaining research productivity. A popular motivation perspective called self-determination theory (Deci & Ryan, 1985; Deci et al., 1997) posits satisfaction of three basic psychological needs will determine faculty motivation for research: competence (perceived research expertise or skill), autonomy (freedom to choose research questions to study), and relatedness (feeling connected with colleagues and students). If these needs are supported, faculty will experience optimal, autonomous motivation (task engagement because it is enjoyable [intrinsic] and/or

valuable [identified]) and be more likely to successfully produce scholarly work. However, faculty are paid to conduct research, frequently evaluated, subjected to deadlines, pressured to win grants, and sometimes interact with difficult students and colleagues—all factors that if emphasized can make faculty feel extrinsic motivation (task performance to prevent guilt or anxiety [introjected] and/or to gain rewards or avoid punishment [external]), leading to low productivity. Thus, a critical assertion of SDT is that the *type* of motivation is more important than the quantity of motivation in predicting outcomes (Deci & Ryan, 2008).

Empirical support for the suitability of SDT to understand faculty motivation is growing. Walker and Fenton (2013) found 36 highly productive professors to cite intrinsic motivation, characterized by fun, enjoyment, and passion, as the most common and important factor supporting their research productivity, more so than any other personal (e.g., time management, skills) or institutional characteristics (e.g., research emphasis, resources). Bland et al.'s (2005) survey of 465 faculty found being "internally driven to conduct research" the strongest variable in predicting who had produced more than five articles in the last two years. Also, findings from Hardré et al. (2011) with 781 faculty members showed intrinsic motivation for research to have a significant positive effect on their perceived value of conducting research that, in turn, predicted research effort and ultimately research productivity (see also Stupnisky et al., 2017). Limitations of past research include low generalizability samples, incomplete consideration of SDT theory motivation types, and questionable measures of research success.

The current study tested a conceptual model hypothesizing a central role of SDT motivation in faculty members' research success (see Figure 1). Key research questions included, in what ways are faculty members typically motivated to conduct research (autonomous or controlled)? To what extent are faculty SDT basic needs satisfied (autonomy, competence,

relatedness), and how do they relate to faculty motivation? How do demographic (gender, ethnicity) and professional variables (research hours per week, discipline) affect faculty motivation for research, and in turn their success? And, how does motivation predict faculty member success? This study contributes beyond previous research on faculty motivation by (1) using a large, multinational sample of faculty members across a variety of disciplines; (2) utilizing multi-item scales and latent variables in structural equation models to improve the reliability and validity of findings; and (3) examining motivation beyond intrinsic (i.e., autonomous) motivation to consider the roles of introjected and external extrinsic motivations.

Methods and Materials

Participants and Procedure

Participants were 1,846 faculty members recruited from 21 USA institutions near the end of the 2017-18 academic year (March to May) who completed an experimental extra item set appended to the end of the Faculty Survey on Student Engagement (FSSE).

The participants were approximately equal men and women (see Table 1) with an average age of 50.3 years (SD=11.9). The majority of participants were White (60.6%) and straight (84.3%), with ranges representative of faculty across the United States (FSSE 2018). Participant distributions across rank, tenure status, and discipline were fairly even. Faculty reported average hours spent on work tasks as teaching 19.7 (SD=9.1), research 9.6 (SD=8.5), service 8.7 (SD=7.8), and advising 5.5 (SD=5.5).

Measures

SDT psychological needs. Van den Broeck et al.'s (2010) Work-related Basic Need Satisfaction scale (W-BNS; adapted from Stupnisky et al., 2017) measured faculty members' perceived level of need satisfaction regarding their research. Following the question, "In your

scholarship, how often do you feel the following?" were 12 items equally distributed among three subscales (1=*Never*, 4=*Very often*): autonomy ("I have a sense of freedom to make my own choices."), competence ("I have confidence in my ability to do things well."), and relatedness ("I am supported by the people whom I care about [students, colleagues, etc.].").

Motivation. Motivation was measured using twelve items adapted from Frenet et al. (2004) and Stupnisky et al. (2017; 1=*Very little*, 4=*Very much*). Regarding the question, "To what extent are the following reasons for why you engage in scholarly activities?", faculty members responded to 12 items distributed across four subscales: intrinsic ("It is enjoyable to engage in scholarship."), identified ("My scholarship is important to me."), introjected ("I would feel guilty not engaging in scholarly activities."), and external motivation ("Because I am paid to produce scholarship."). Exploratory factor analysis and correlations suggested the intrinsic and identified subscales be combined to form the autonomous motivation subscale, which is consistent with past research on faculty motivation for teaching (Stupnisky et al., 2018).

Success. Faculty rated their scholarly productivity over the last three academic years on four items on a 5-point scale (1=*Well below average*, 3=*Average*, 5=*Well above average*; Stupnisky et al., 2015, 2017): "Your own standards", "Your department's standards for tenure and promotion", "Colleagues in your department", and "Colleagues in your field(s)". Finally, we asked faculty to provide a frequency count for how many times in the past three years their "scholarly writings have been accepted for publication?"

Results

Descriptive statistics and reliabilities. The items all showed sufficiently normal distributions (i.e., skewness less than 2.3, Lei & Lomax, 2005; kurtosis less than 7.0, Byrne, 2010), with the exception of number of publications (skew=3.2, kurtosis=8.4). The scales had

good reliability (i.e., Cronbach's alpha adequate > .70, good > .80; Warner, 2013), thus the items were averaged into summative scales (see Table 2). Faculty data showed high mean levels of autonomy, competence, and relatedness for research, and in turn, reported more autonomous motivation for research than introjected or external motivation.

Group differences. Independents samples *t*-tests across all study variables revealed numerous statistically significant effects but very few of noteworthy practical size (based on Cohen's d small = 0.2, medium = 0.5, large = 0.8). In terms of gender, the largest effects were men reporting more research autonomy, $t(1736)=3.29$, $p=.001$, $d=0.16$ ($M_{men}=3.37$, $M_{women}=3.28$), and perceived success, $t(1736)=3.60$, $p<.001$, $d=0.17$ ($M_{men}=3.40$, $M_{women}=3.24$). For ethnicity, white faculty members reported more autonomous motivation, $t(1844)=6.55$, $p<.001$, $d=0.32$ ($M_{white}=3.36$, $M_{non-white}=3.15$), but also more external motivation, $t(1844)=6.08$, $p<.001$, $d=0.29$ ($M_{white}=2.41$, $M_{non-white}=2.17$). Based on discipline, no differences were found between STEM and non-STEM faculty. Additional analysis on the roles of demographic and professional variables in faculty motivation for research are ongoing.

Correlations. Many correlations among the latent variables revealed strong support for SDT among faculty (see Table 3). For instance, moderately large positive correlations were found among autonomy, competence, relatedness, and autonomous motivation. These constructs also had many strong positive correlations with perceived success, the largest coming from autonomous motivation. Autonomous motivation also had a moderately positive correlation with number of publications. Alternatively, the basic needs had much smaller correlations with introjected and external faculty motivation for research, which in turn had smaller correlations with perceived success and publications.

Structural equation modeling. Using the AMOS structural equation modeling program, measurement models found adequate goodness-of-fit to the data and strong item-to-factor loadings, supporting the quality of the measurement scales, $\chi^2(252)=1409.75$, RMSEA=.05, CFI=.96. Next, two structural models were constructed to test the conceptual model; specifically, that faculty basic needs would be positively associated with their autonomous motivation (less or negatively associated with controlled motivation types), with autonomous motivation in turn positively relating to research success. The models also included the average number of hours spent on research per week to control for institutional research requirements. Both models had adequate goodness-of-fit to the data. The models varied only by their final endogenous variable being perceived success ($\chi^2(273)=1587.46$, RMSEA=.05, CFI=.95) or number of publications ($\chi^2(207)=1469.17$, RMSEA=.06, CFI=.94).

For both models (see Figures 2, 3), autonomy and competence positively predicted autonomous motivation in support of SDT. Together the basic needs and research hours explained 34% of the variance in autonomous motivation. Autonomous motivation, in turn, was the strongest significant predictor of perceived research success and number of publications. Tests of mediation involved 5000 bootstrap samples with 95% bias corrected confidence intervals to test indirect effects of the basic needs on perceived success. Indeed, autonomy and competence were found to be significant indirect predictors of perceived success.

Regarding the other motivations for research, autonomy also positively related to introjected and external motivation, while competence was negatively related to introjected and external motivation. Furthermore, external motivation was a significant predictor of research success although to a lesser extent than autonomous motivation, while introjected motivation

was not a significantly predictor. Altogether, the models explained 27% of the variance in

perceived success and 14% of the variance in number of publications.

Conclusions and Significance of Study

The current study sought to better understand faculty research productivity by examining

the role of motivation with an established motivation theory. The critical finding was that

autonomous motivation, which represents engagement based on enjoyment and valuing scholarly

activity, was the strongest predictor of faculty research productivity in the tested model. This

finding supports the limited past research on faculty motivation for research (Bland et al., 2015;

Hardre et al., 2011; Lechuga, 2012; Walker & Fenton, 2013; Stupnisky et al., 2017), but also

expands our knowledge by utilizing a large-scale USA sample, a more complete assessment of

SDT, and multiple measures of research productivity. This finding additionally accounted for

number of hours spent on research per week as a proxy of contractually expected effort and

institutional expectations.

What leads to autonomous motivation? Faculty autonomy (i.e., choice) and competence

were each positive predictors of the optimal motivation state, which indirectly predicted faculty

research productivity. Practical applications are suggested mechanisms to support faculty

research. Autonomy can be fostered by encouraging faculty to choose their research questions

and scholarly pursuits that they are most interested in, passionate about, and deem valuable.

Competence can be promoted by universities offering ample opportunities for professional

development, such as attending workshops, conferences, and facilitating collaborations.

Extrinsic motivations were not as beneficial to faculty research performance, as external

motivation (engagement to earn rewards) had a small positive relationship while introjected

motivation (task performance to avoid guilt or shame) had no relationship with productivity. It

was interesting that external motivation had even a small positive relationship, suggesting

conducting research for monetary rewards can increase productivity, but was still not as effective

as boosting enjoyment and value.

Results will inform higher education institutions, particularly those striving to increase

scholarly productivity, as to specific strengths and deficits in faculty motivation for research that

contribute to measurable gains in research activity. Ultimately, findings will provide guidance to

universities, government, and industries on how to best support research faculty to produce

innovative basic and applied scientific knowledge, to tackle key social and economic challenges

with their research, and to train the next generation of flexible, knowledgeable, and diverse

researchers.

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Table 1

Respondent Characteristics

		Count	Percent
Disciplinary Area	Arts & Humanities	379	20.5
	Biological Sciences, Agriculture, & Natural Resources	149	8.1
	Physical Sciences, Mathematics, & Computer Sciences	191	10.3
	Social Sciences	200	10.8
	Business	141	7.6
	Communications, Media, & Public Relations	63	3.4
	Education	191	10.3
	Engineering	88	4.8
	Health Professions	188	10.2
	Social Service Professions	76	4.1
	Other disciplines	170	9.2
Academic Rank	Full Professor	408	22.1
	Associate Professor	458	24.8
	Assistant Professor	447	24.2
	Instructor	322	17.4
	Lecturer	211	11.4
Tenure Status	No tenure system at this institution	138	7.5
	Not on tenure track, but this institution has a tenure system	584	31.6
	On tenure track but not tenured	428	23.2
	Tenured	684	37.1
Gender Identity	Man	860	46.6
	Woman	878	47.6
	Another gender identity	4	0.2
	I prefer not to respond	83	4.5
Racial/Ethnic Identification	American Indian or Alaska Native	7	0.4
	Asian	100	5.4
	Black or African American	202	10.9
	Hispanic or Latino	133	7.2
	Native Hawaiian or Other Pacific Islander	1	0.1
	White	1,119	60.6
	Other	30	1.6
	Multiracial	72	3.9
	I prefer not to respond	167	9.0
Sexual Orientation	Straight (Heterosexual)	1,557	84.3
	Gay	25	1.4
	Lesbian	9	0.5
	Bisexual	24	1.3
	Queer	8	0.4
	Questioning or unsure	3	0.2
	Another sexual orientation	5	0.3
	I prefer not to respond	204	11.1

Table 2

Reliabilities and Descriptive Statistics for Study Variables

Measure	α	M	SD	range
Basic Needs				
Autonomy	.81	3.31	.59	1-4
Competence	.86	3.51	.55	1-4
Relatedness	.87	3.18	.67	1-4
Motivation				
Autonomous	.92	3.23	.71	1-4
Introjected	.80	2.25	.90	1-4
External	.77	2.27	.84	1-4
Success				
Perceived	.85	3.32	.92	1-5
Number publications	-	9.74	25.29	0-10+

Table 3

Correlations

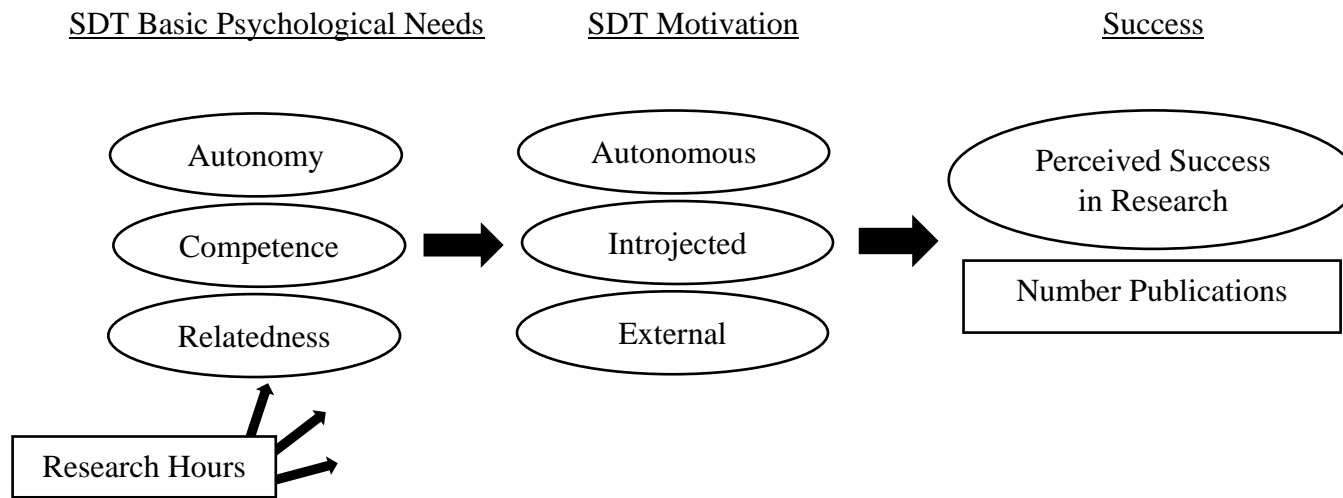|	1	2	3	4	5	6	7	8
1. Autonomy	-							
2. Competence	.65*	-						
3. Relatedness	.63*	.52*	-					
4. Autonomous motivation	.45*	.44*	.31*	-				
5. Introjected motivation	.06	-.02	.05	.28*	-			
6. External motivation	.12*	.04	.08*	.24*	.46*	-		
7. Perceived success	.35*	.36*	.25*	.47*	.15*	.24*	-	
8. Number publications	.14*	.12*	.01	.31*	.13*	.21*	.43*	-

*p < .01

Figure 1. Conceptual Model of Faculty Motivation and Research Success
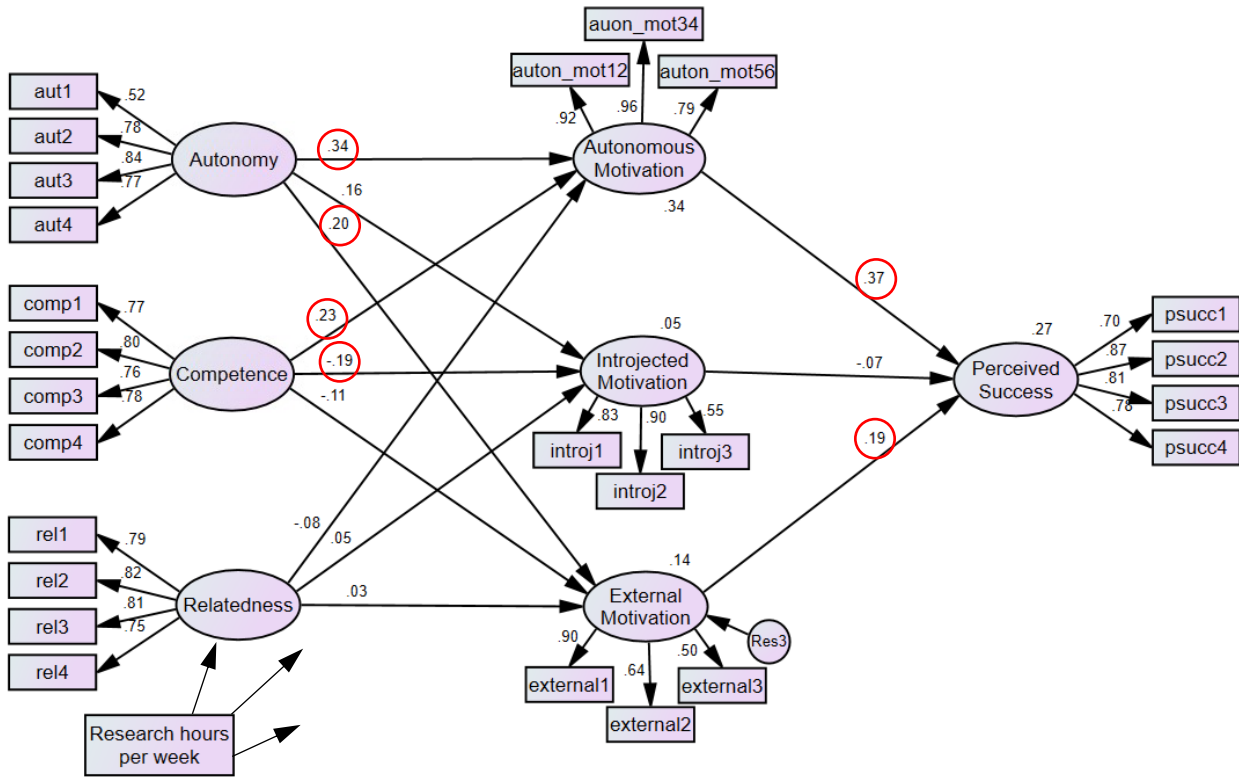
Figure 2. Structural equation model with perceived success. Significant paths at *p* < .01 circled, with parameters on top of lines. Latent variable R-squares above upper right corner of respective latent variables.
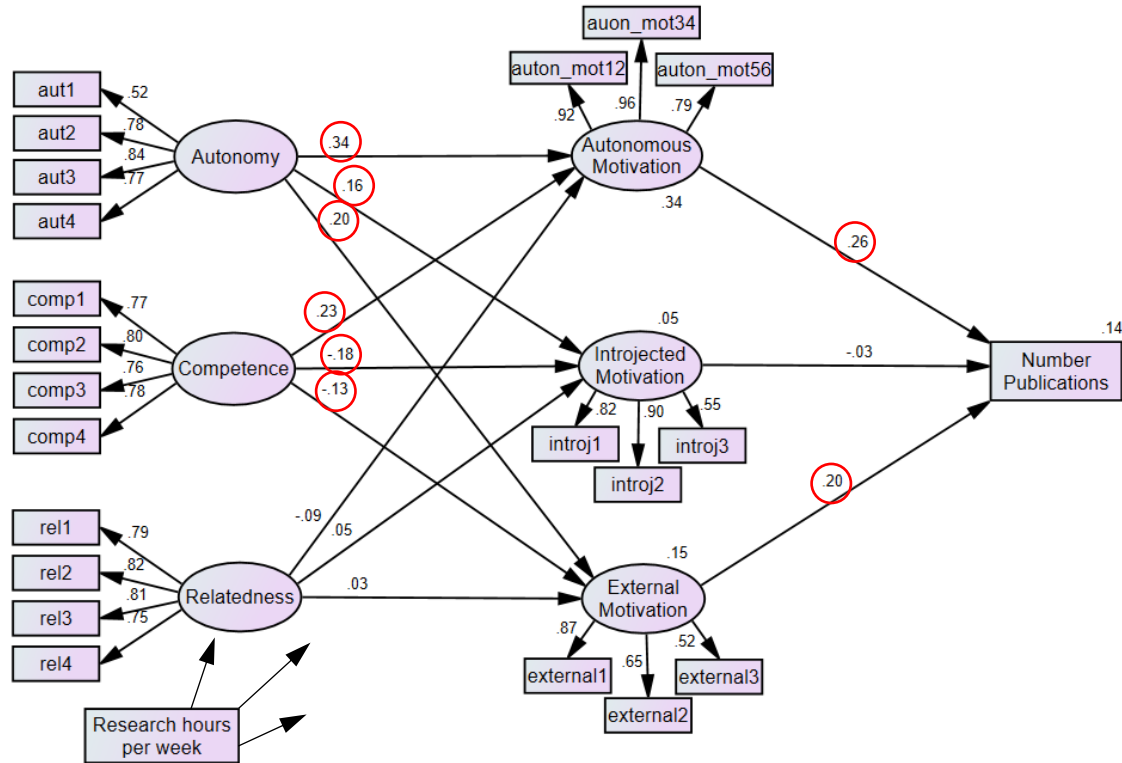

Figure 3. Structural equation model with number of publications. Significant paths at *p* < .01 circled, with parameters on top of lines. Latent variable R-squares above upper right corner of respective latent variables.