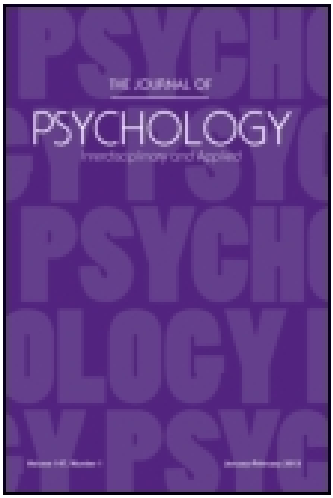

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Intrinsic Motivation, Performance, and the Mediating Role of Mastery Goal Orientation: A Test of Self-Determination Theory

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Intrinsic Motivation, Performance, and the Mediating Role of Mastery Goal Orientation: A Test of Self-Determination Theory

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ABSTRACT. Although intrinsic motivation has been linked repeatedly to performance and outcomes, the causal relationship between the two has remained unclear. To explain the link, this study considered the focusing influence of mastery goals. Using a three-wave panel study and hypotheses drawn from self-determination theory and achievement goal theory, the current study sought to clarify the relationships between intrinsic motivation, mastery goal orientation, and performance. Specifically, the current study hypothesized and found that mastery goals mediated (explained) the relationship between intrinsic motivation and performance.

Keywords: achievement, autonomy, effectiveness, learning goals, self-regulation

WHEREAS META-ANALYTIC FINDINGS CONFIRM moderate to strong associations between intrinsic motivation and performance (Cerasoli, Nicklin, & Ford, in press), the field of motivation currently has little empirical data demonstrating *why* intrinsic motivation is related to performance. The goal of this article is to more fully understand the causal links between intrinsic motivation and performance. To address this gap in the literature, the current study proposes mastery goals as a mediator of the intrinsic motivation–performance relationship. First, we turn to self-determination theory (Deci & Ryan, 1985, 2000; Ryan & Deci, 2000) to examine the theoretical background of intrinsic motivation, briefly exploring its conceptualization and relationship to criterion-relevant performance behaviors.

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Second, to describe how the drive from intrinsic motivation is focused to predict criterion-relevant performance behaviors, we turn to mastery goal orientations from achievement goal theory (Elliot & Church, 1997). Using the two theories as a guiding framework, we present a longitudinal study to examine the links among intrinsic motivation, criterion-relevant performance behaviors, and performance.

Intrinsic Motivation and Performance Behaviors

From a theoretical perspective, intrinsic motivation describes the innate propensity to pursue interesting tasks that challenge one's skills and foster growth (Deci & Ryan, 1985) and should have a positive link to performance. People assemble puzzles and solve crosswords because rising to a challenge and succeeding imparts a degree of satisfaction. Intrinsically motivated behaviors are produced and maintained because the enjoyment such tasks impart reinforces the behavior (Lavigne et al., 2009).

The relationship between intrinsic motivation and performance has been supported in previous research. Intrinsically motivated students elicit higher levels of task persistence and show greater desire toward behaviors such as attending class and staying in school (Hardre & Reeve, 2003; Robbins et al., 2004). Such students tend to have higher levels of confidence and persistence; this leads them to implement more of the deep-level learning behaviors that have been found to predict higher exam scores (Simons, Dewitte, & Lens, 2004). As would be expected, emerging meta-analytic work supports the hypothesis that the relationship between intrinsic motivation and both concurrent and subsequent performance is positive (Cerasoli et al., in press). Longitudinal data should at minimum confirm these findings.

Hypothesis 1: Initial levels of intrinsic motivation predict concurrent and subsequent levels of performance behaviors.

Mastery Goal Orientations and Performance Behaviors

Goal orientations describe how an individual frames, focuses, and approaches performance situations. Broadly defined as "the desire to develop, attain, or demonstrate competence at an activity" (Harackiewicz & Elliot, 1993, p. 904), the term "achievement goals" defines the purpose or reason for engaging in the task in the first place (Maehr & Nicholls, 1980), as well as subsequent affect, cognition, and behavior to obtain a task objective (Dweck, 1986).

Mastery goal orientations should be positively related to performance behaviors. Individuals who possess mastery goal orientations engage in academic performance behaviors because of the desire to develop competence (Elliot & Harackiewicz, 1996) and attain task mastery (Dweck & Elliot, 1983; Nicholls, 1984). Such individuals do not wish merely to obtain passing criterion but rather

aim for a deep, comprehensive understanding of the material in question. As a result, mastery-oriented individuals show a pattern of preference for challenging tasks, persistence when faced with failure, higher levels of task enjoyment, and positive attitudes toward learning (Elliot & Harackiewicz, 1996). These attitudes lead mastery-oriented individuals to dedicate themselves to performance behaviors that develop one's skills.

Meta-analytic work supports this argument; possession of a mastery goal orientation has been linked to positive academic performance behaviors such as feedback seeking, complex learning strategies (Payne, Youngcourt, & Beaubien, 2007), greater metacognitive strategies (Ford, Smith, Weissbein, Gully, & Salas, 1998), and higher motivation to learn (Colquitt & Simmering, 1998). Thus, we expect longitudinal data to mirror findings that mastery goal orientations are positively related to concurrent and subsequent performance behaviors and outcomes.

Hypothesis 2: Mastery goals are positively related to concurrent and subsequent performance behaviors.

Motivation, Goal Orientation, and Performance Behaviors

Although extensive associations have been drawn empirically among intrinsic motivation, mastery goal orientations, and performance, there is currently a lack of theory and research causally linking them together. First, we examine definitional and theoretical overlap in the existing literature regarding intrinsic motivation and mastery goal orientation. Second, we examine how current research may not support causal inferences among intrinsic and extrinsic motivation, goal orientation, and performance behaviors. In the following section, we build on these two points to offer a complementary model in which intrinsic motivation leads to achievement goal orientation, which in turn affects performance behaviors.

Definitional and Theoretical Overlap

Inconsistencies with which the temporal precedence between intrinsic motivation and goal orientation are drawn may be due in part to an overlap in how the two are defined. For example, intrinsic motivation (Deci, 1975; Harlow, 1958; White, 1959), mastery goal orientation (Ames & Archer, 1987, 1988; Dweck, 1986; Elliot & Church, 1997; Nicholls, 1984), and achievement motivation (Atkinson, 1957, 1964) are all fundamentally described as approach forms of motivation. Similarly, both intrinsic motivation (Eccles & Wigfield, 2002) and achievement motivation (Atkinson, 1957) are considered to be stable trait or dispositional constructs. As one might see, there is likely an overlap of the constructs.

Second, explanatory links between intrinsic motivation and performance may be lacking due to competing theory. On one hand, some researchers suggest motivation precedes goal orientation. Findings from Lee, Sheldon, and Turban (2003) using university students are consistent with a behavior regulation → goal

orientation model. On the other hand, studies in line with Elliot, Dweck, and colleagues suggest the opposite, such that goal orientation → behavior regulation (Dweck, 1975, 1986, 1989; Dweck & Elliot, 1983; Dweck & Leggett, 1988). Thus, the two competing theories have not been subjected to empirical examination using data warranting causal inferences.

Insufficient Empirical Support for Causal Inferences

Currently, the majority of studies examining relationships among achievement goal orientations, motivation, and performance examine relationships using data that cannot support the causal hypotheses for which they are intended. Cross-sectional designs do not absolutely represent change, nor do they rule out alternative explanations of causation (Ployhart & Vandenberg, 2010). There is often a stronger basis for causal inferences when using experimental studies with proper controls (Cook, Campbell, & Peracchio, 1990). However, experimental studies with motivation and goal orientation may have limited generalizability beyond a particular study if they artificially induce goal orientations (e.g., Cury, Elliot, Sarrazin, Da Fonseca, & Rufo, 2002), implement narrow interventions (e.g., Cueva, 2007), or assess constructs within a lab setting (e.g., Lorenzet, 2001). Longitudinal studies can provide a stronger basis for causal inferences in a more naturalistic environment. Unfortunately, most of the few naturalistic longitudinal studies available are not truly longitudinal, as they do not administer the same measures at multiple points in time (e.g., Kim, 1996). While one available study has administered the same measures of intrinsic motivation and goal orientation at multiple points in time (i.e., Papaioannou, Bebetsos, Theodorakis, Christodoulidis, & Kouli, 2006), it did not address whether or how motivation and goal orientation were related either empirically or theoretically.

To solve these two problems, the field requires both better theoretical definition and longitudinal studies establishing causality (Cook et al., 1990) within a nomological network. Toward that end, we propose further integration of the two theories and implement a multiple-wave panel design study (c.f., Frese, Garst, & Fay, 2007; Zapf, Dormann, & Frese, 1996) that captures these constructs at multiple time points in a natural environment. Next, we introduce a theoretical and empirical justification for our proposed model.

Mastery Goal Orientation as a Mediator Between Intrinsic Motivation and Performance

In part, we aim to replicate previous findings that intrinsic motivation is positively associated with mastery goals. However, we also propose the relationship between intrinsic motivation and subsequent performance should be mediated by mastery goal orientation for a number of reasons. First, although intrinsic motivation tends to be positively associated with engagement in performance behaviors,

intrinsic motivation is not a sufficient causal condition for performance; it is perfectly reasonable to enjoy a task and exert no effort whatsoever toward improving it (e.g., a child making music by banging on pots and pans). Instead, intrinsic motivation becomes a sufficient causal condition for performance in the presence of mastery goals because mastery goals give an intrinsically motivated individual additional purpose (Elliot & Church, 1997) and focus (Maehr & Nicholls,1980).

Second, intrinsic motivation essentially describes interest and enjoyment of an activity for its own sake (Deci & Ryan, 1985). Under this definition, an individual could imaginably enjoy the performance of a given activity and persist at it for extended periods of time yet perform poorly (much like a child banging on pots and pans to create music). For this reason, mastery goals should mediate the relationship between intrinsic motivation and performance because they focus one's efforts on activities that are competence (rather than merely satisfaction) relevant (Maehr & Nicholls, 1980; Rawsthorne & Elliot, 1999).

Last, we argue researchers should consider the possibility that causality is not unidirectional because mastery goals can positively influence subsequent levels of intrinsic motivation, as mastery goals are thought to foster perceptions of challenge, encourage task involvement, and generate excitement, all of which support intrinsic motivation (Elliot & Harackiewicz, 1994, 1996). For example, a child who finds music enjoyable may seek out opportunities to practice and improve his or her skill. In turn, this would both boost intrinsic enjoyment of the music and performance. In line with similar research (e.g., Malmberg, 2006, 2008), we propose that the drive to pursue intrinsically satisfying tasks causes individuals to adopt mastery goal orientations, leading to further subsequent boosts in both intrinsic motivation and perforance.

Hypothesis 3a: Intrinsic motivation is positively associated with concurrent and subsequent levels of mastery goals.

Hypothesis 3b: Mastery goal orientations mediate the relationship between prior levels of intrinsic motivation and subsequent levels of performance behaviors.

Hypothesis 3c: Mastery-goal orientations have reciprocal effects on intrinsic motivation such that initial levels of intrinsic motivation predict change in subsequent mastery goal orientations which, in turn, predict subsequent changes in levels of intrinsic motivation.

Method

Participants and Procedure

Participants were students enrolled in two sections of introduction to Industrial-Organizational Psychology at a large university in the Northeast United States. From the original 148 time 1 (semester beginning) respondents, complete data was obtained at time 2 (mid-semester) for 109 respondents, and at time 3

(semester end) for 91 respondents. Following semester's end (week 17), information was obtained from official university records on class, term, and overall cumulative performance, resulting in a final listwise sample of 89 respondents. Women comprised a slight majority (60.7%) of the sample and most respondents identified themselves as being white or Caucasian (71.3%). Attrition was due to natural causes, as drop-out analyses (i.e., *t*-tests on all variables with complete data) did not indicate any statistically significant differences on study variables assessed.

Measures

Intrinsic Motivation

The Self-Regulation Questionnaire for Learning (SRQ-L; Williams & Deci, 1996; Black & Deci, 2000) was modified for the current study to assess why an individual was motivated academically. Three series of questions assessed the extent to which respondents were motivated intrinsically on a likert-type scale with *1 = strongly disagree* to *5 = strongly agree*. Seven intrinsic motivation questions demonstrated good internal reliability at three points in time ($\alpha = .80$, .82, and .83, respectively) and included items such as "... because I feel like it's a good way to improve my skills and my understanding of psychology" and "... because learning the basic concepts is an important part of being a student and later as a professional."

Mastery Goal Orientation

A 14-item measure tested and previously validated by Simons et al. (2004) was used to assess mastery goal orientation. This scale was intentionally used over the more common Elliot and Church (1997) measure because in an introductory I-O psychology course, there is a good chance respondents might be exposed to the items of the measure, introducing a possible confound. The scale used included five items such as "Mastering the material is the most important thing" and "I engage in the material because the material interests me." Reliability estimates for the current sample at three points in time demonstrated adequate levels of internal consistency, yielding alphas of .72, .76, and .80, respectively.

Performance Behaviors

The work methods subscale of the Survey of Study Habits and Attitudes (SSHA; Brown & Holtzman, 1955, 1966) was used as a self-report assessment of performance behaviors. The 24-item work methods sub-scale was used to obtain a behavioral rating of academic performance behaviors. Although initial scale reliabilities were within the limits of conventional acceptance ($\alpha = .81$, .80, and .80), we opted to examine the scale further, as alpha alone should not be considered as an indicator of unidimensionality or precision (Cortina, 1993). Out

of the original 24 items, eight items were dropped due to low corrected item-total correlations (<.20) and alpha-if-item-removed (dropped items were primarily those that were reverse coded), resulting in sixteen items that were finally used ($\alpha = .87$, .85, and .86, respectively).

Results

Bivariate Effects

Descriptive statistics, reliabilities, and intercorrelations are reported in Table 1. Hypothesis 1 (that initial levels of intrinsic motivation predict concurrent and subsequent levels of performance behaviors) was supported. Referring to zero-order correlations in Table 1, intrinsic motivation was positively related to self-reported performance at times 1, 2, and 3 (r = .68, .63, .63, $p < .01$). Also as predicted, time 1 intrinsic motivation was associated with performance at times 2 and 3 ($r = .64$, .55, $p < .01$) and time 2 intrinsic motivation was associated with performance at time 3 ($r = .48$, $p < .01$).

Hypothesis 2 (that mastery goals are positively related to concurrent and subsequent performance behaviors) received support. Referring to zero-order correlations in Table 1, mastery goals were related to performance at times 1, 2, and 3 (r = .58, .53, .61, $p < .01$). Mastery goals at time 1 predicted subsequent performance at times 2 and 3 ($r = .57$, .54, $p < .01$). Mastery goals at time 2 predicted subsequent performance at time 3 ($r = .58$, $p < .01$).

Hypothesis 3A (that intrinsic motivation is positively related to concurrent and subsequent levels of mastery goals) was supported. Referring to zero-order correlations in Table 1, intrinsic motivation was concurrently related to mastery goals at all three points in time (r = .78, .68, .72, $p < .01$). As expected, intrinsic motivation at time 1 was related to subsequent mastery goals at times 2 and 3 ($r = .66$, .57, $p < .01$) and intrinsic motivation at time 2 was related to subsequent mastery goals at time 3 ($r = .59$, $p <.01$).

Testing Mediated Effects Using Path Modeling

To test mediation hypotheses, five nested models were constructed and compared to a sixth baseline autocorrelation model using *LISREL 8.8* (Joreskog & Sorbom, 2007) and longitudinal data. Examples of each model are shown in Figure 1 and models are listed in Table 2. It should be noted that as the models are nested (i.e., all have the same observed indicators), they can be compared to each other for statistical significance in terms of chi-square and degrees of freedom.

The baseline autocorrelation model (Model 1) allows constructs at time 1 to freely correlate with one another and also assumes that each construct is related to itself across time. The second and third models have the same number of parameters (i.e., degrees of freedom) but test two competing hypotheses. The

TABLE 1. Intercorrelations, Reliabilities, and Descriptive Statistics Among Study Variables

	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
TIME 1: 0 WEEKS														
1. Intrinsic Motivation	4.07	.56	(.80)											
2. Mastery GO	3.82	.63	.80*	(.72)										
3. Self-Report Performance	3.86	.61	.68*	.58*	(.86)									
TIME 2: 8 WEEKS														
4. Intrinsic Motivation	3.99	.59	.69*	.73*	.58*	(.82)								
5. Mastery GO	3.67	.66	.66*	.68**	.47*	.64*	(.76)							
6. Self-Report Performance	3.67	.61	.64*	.57*	.75*	.63*	.53*	(.85)						
TIME 3: 15 WEEKS														
7. Intrinsic Motivation	3.94	.65	.73*	.64*	.54*	.67*	.58*	.63*	(.83)					
8. Mastery GO	3.65	.69	.57*	.67*	.40*	.59*	.72*	.49**	.72*	(.80)				
9. Self-Report Performance	3.66	.59	.55*	.54*	.62*	.48*	.58*	.78*	.63*	.61*	(.86)			
TIME 4: 17 WEEKS														
10. Official Class Grade	2.81	.95	–.10	–.02	–.14	.08	.04	.03	.10	.09	.08	(—)		
11. Official Term Grades	3.07	.74	–.07	.01	–.05	.14	.09	.12	.12	.15	.17	.86*	(—)	
12. Official Cum. GPA	3.01	.52	–.01	.09	.04	.23**	.20***	.17	.18***	.20***	.25**	.76*	.84*	(—)

Note. listwise n = 89, reliabilities listed on the diagonal; GPA = Grade Point Average, GO = Goal Orientation; mean for GPA is based on raw data collapsed across classes.

*Correlation is significant at the 0.01 level (2-tailed).

**Correlation is significant at the 0.05 level (2-tailed).

***Correlation is significant at the 0.10 level (2-tailed).

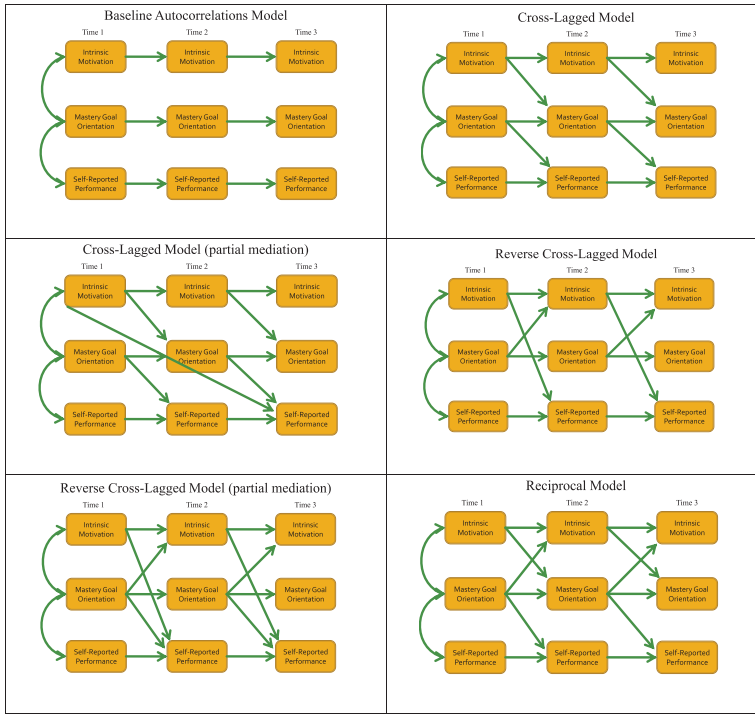

FIGURE 1. Path model examples. (Color figure available online).

second (cross-lagged) model (Model 2A) tests the main hypothesis that goal orientation is a mediator while the third (reverse cross-lagged) model (Model 3A) contains the same degrees of freedom and tests the alternative hypothesis that motivation is instead the mediator. The fourth (reciprocal) model (Model 4) tests whether the independent and dependent variable each cause or explain subsequent change in each other (in a certain sense, the fourth model is a combination of the second and third). All models are reported in Table 2, numbered for convenience, and interpreted by conventional guidelines set forth by Hu and Bentler (1998, 1999). In addition, because fewer than 19% of published articles acknowledge fundamental assumptions for path modeling and less than 10% explicitly test for violations thereof (Breckler, 1990), we examined and found no evidence of substantial skewness, kurtosis, or outliers for either univariate or multivariate analyses.

Significance of model change was gauged by reference to a significant chi-square change, with its respective degrees of freedom. Four model fit indices

TABLE 2. Mediation Tests of Model Improvement Over a Baseline Autocorrelation Model

Model #	Model Description	χ^2	*df*	RMSEA	Δ *df*	$\Delta\ \chi^2$	*p*	CFI	IFI	NFI
1	Autocorrelations	135.10	27	0.19				0.91	0.91	0.89
2A	Cross lagged, fully mediated	109.25	23	0.20	4	25.85	*	0.93	0.93	0.91
2B	Partially mediated	109.05	22	0.20				0.93	0.93	0.91
3A	Reverse cross lagged, fully mediated	119.69	23	0.19	4	15.41	*	0.92	0.92	0.90
3B	Partially mediated	115.03	22	0.19				0.92	0.92	0.91
4	Reciprocal	99.98	21	0.21	6	35.12	*	0.93	0.93	0.92

Note. Change statistics for all models based on the first model in the set; IM = Intrinsic Motivation; MGO = Mastery Goal Orientation; SSHA = Survey of Study Habits and Attitudes (self-reported performance); RMSEA = root mean square error of approximation; CFI = comparative fit index; IFI = incremental fit index; NFI = normed fit index; χ^2 = minimum fit function chi-square; RMSEA values may be inaccurate in models with small samples/many parameters (Hu & Bentler, 1999); *p* = statistical significance level.
*significant at the 0.01 level.

were chosen to assess model fit. The first three were incremental/comparative indices. The Normed Fit Index (NFI; Bentler & Bonnett, 1980) is derived from the comparison of a hypothesized model to that of a null (i.e., independence) model. Although the NFI suits the current study's purpose because it provides a complete measure of covariation in the data, it can underestimate fit in small samples. To better gauge fit for the current study's small sample size, we include Bentler's (1990) Comparative Fit Index, which takes sample size into account. In addition, because simplicity is always important to theory in the social sciences, we included the Incremental Fit Index (IFI; Bollen, 1989). The IFI is essentially the same as the NFI, with the exception that it rewards parsimony by adding a correction for degrees of freedom. In general, fit indices above .90 demonstrate modest fit (Byrne, 2010), whereas those above .95 suggest excellent fit (c.f., Bentler, 1990). Last, we include an approximation error fit index. The root mean square error of approximation (RMSEA; Browne & Cudeck, 1993) examines how well the model (given unknown but optimally chosen parameter values) would fit the population covariance matrix if it were available. Whereas several have noted

that small sample sizes can lead to over-rejection of true population models (e.g., Browne & Cudeck, 1993; Fan, Thompson, & Wang, 1999; MacCallum, Browne, & Sugawara, 1996), inferring limited use of the RMSEA with the current sample, we include these estimates as a matter of convention (Byrne, 2010.)

To test hypothesis 3B (that mastery goal orientation mediates the relationship between intrinsic motivation and self-reported performance), we first tested a fully-mediated model. Model 2A, the fully-mediated model fit the data significantly better than a baseline autocorrelation model ($\Delta\chi^2$ (4) = 25.85, $p < .01$). We then compared this model to a partially mediated model in which a direct path from time 1 intrinsic motivation to time 3 self-reported performances was drawn. The resulting partially mediated model was not a significantly better fit to the data (Model 2B; $\Delta\chi^2$ (1) = .20, *ns*) than the mediated model, suggesting that the relationship between intrinsic motivation and subsequent changes in study habits is completely (rather than partially) mediated by changes in mastery goal orientation, supporting hypothesis 3B. Also, model 3A significantly improved over the baseline model $\Delta\chi^2(4) = 15.41, p < .01$), supporting the alternative hypothesis (i.e., that changes in intrinsic motivation mediate the relationship between mastery goal orientation and changes in study habits).

The strongest support from this set of models comes for hypothesis 3C (that intrinsic motivation and mastery goals have reciprocal effects on each other). The final model (Model 4) includes reciprocal effects among intrinsic motivation and goal orientation and their respective effects on self-reported performance. The reciprocal effects model was significantly better than the baseline autocorrelations model ($\Delta\chi^2$ (6) = 35.12, $p < .01$), implying that intrinsic motivation and mastery goal orientation affect each other and performance over time. Further, we examined whether the reciprocal model improved significantly over both the fully mediated cross lagged model (2A) and the fully mediated alternative reverse cross lagged model (3A). Analyses confirming this change was significant over both models (2A: $\Delta\chi^2$ (2) = 9.27, $p < .01$ and 3A: $\Delta\chi^2$ (2) = 19.71, $p < .01$) support hypothesis 3C. Thus, as expected, there is sufficient evidence that intrinsic motivation (B = .32, .21, $p < .05$) and mastery goal orientation (B = .23, .25, $p < .05$) positively affect each other and self-reported performance over time. The full final structural model for intrinsic motivation is depicted graphically in Figure 2.

We performed bootstrapped estimates of all parameters in the model because it is helpful in small or non-normal samples (Yung & Bentler, 1996) and should be performed whenever possible in path modeling procedures that concern mediation (Preacher, Rucker, & Hayes, 2007), and produces confidence intervals around point-estimates in line with APA recommendations (Wilkinson & APA Task Force on Statistical Inference, 1999). Using a 90% confidence interval (rather than the 95% confidence interval because bootstrapping on normal data can slightly inflate standard errors), all parameters estimated remained significant.

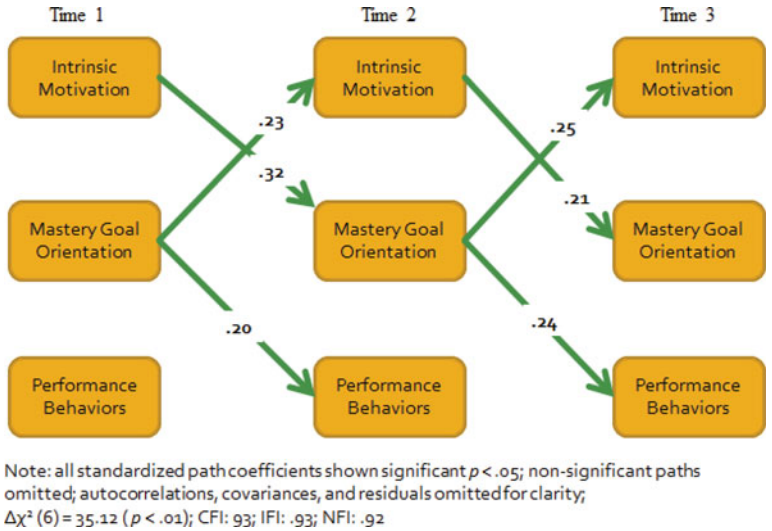

FIGURE 2. Final model: Intrinsic motivation. (Color figure available online).

Discussion

The purpose of this study has been to explore whether mastery goals can explain the relationship between intrinsic motivation and performance. Utilizing a three-wave panel field study, longitudinal data suggest not only that the relationship between intrinsic motivation and performance is mediated by mastery goal orientations but that the two have reciprocal effects upon one another. The use of longitudinal analyses indicates that motivation, goal orientations, and performance vary both within- and between-persons over the course of an academic semester and as such, cross-sectional data based on a static view of these constructs may lead to unwarranted conclusions.

Consistent with previous findings, intrinsic motivation was positively associated with levels of concurrent and subsequent performance behaviors, regardless of when it was measured. Also as expected, mastery goals mirrored the patterns of intrinsic motivation. Mastery goals remained high across the semester, decreasing only slightly over time. Because mastery oriented individuals orient themselves toward tasks that require challenge and persistence, it was hypothesized they would be more likely to engage in performance behaviors. In line with this hypothesis, it was found that mastery goals predicted both concurrent and subsequent levels of performance behaviors.

The central purpose of the current study was to examine why (rather than simply whether) intrinsic motivation predicts performance. Although achievement goal theorists have examined the relationship between intrinsic motivation, mastery goals, and performance in the past, the current study was among the first to theorize and examine explanatory links among the three outside the laboratory. It was hypothesized that mastery goals would explain (mediate) the relationship between intrinsic motivation and performance. It was reasoned that while intrinsic motivation fuels the duration and intensity of behavior, mastery goals provide the focus and direction to orient an individual's drive and cognitions toward the types of competence-relevant (rather than merely satisfaction-relevant) performance behaviors that are predictive of long-term success. Path analyses confirmed this hypothesis; while intrinsic motivation did predict lagged changes in performance behaviors, the relationship between intrinsic motivation at semester beginning and changes in performance over the course of the semester was fully mediated by mid-semester mastery goals. More importantly, we found support for the hypothesis that mastery goals would have reciprocal effects on intrinsic motivation because they encourage the likelihood an individual will find him or herself in opportunities to subsequently engage in intrinsically satisfying tasks. Thus, while findings are in line with the achievement goal theorists' model (that mastery goals $\rightarrow$ intrinsic motivation $\rightarrow$ performance), the current study more strongly supports a reciprocal model (intrinsic motivation $\leftarrow\rightarrow$ mastery goals $\rightarrow$ performance).

Limitations

Because all longitudinal data were based on single-source, single-method collection, the data may be biased by common-method variance. Unfortunately, the extent to which this is present cannot be reliably assessed with the size of the current sample. Realizing in advance there would not be a large enough sample to conduct analyses for common-method biases, we sought other ways to minimize its threat to validity. The extent to which common method biases or other threats to validity are present can be minimized in some cases by temporal separation (Chan, 1998); in the current study, collection of the same measure was separated by eight weeks at each time point. Also, the finding that variables are linked as expected to other variables within the nomological network can reduce concerns about external validity (Hinkin, 1998). For example, self-reported measures of performance correlated moderately with actual performance measures obtained from the university registrar at the end of the semester, as would be expected.

Sample size was a limitation as well in this study. As a result of the small sample size, only structural path modeling (rather than full structural equation modeling) with observed variables was possible. Although this method can answer many of the same questions, full structural equation models that contain both a measurement model and a structural path model (Byrne, 2010) are desirable because they model in error and test for the factor measurement of observed measures.

Despite the fact that most of the hypotheses received support, any study seeking to support causal claims with longitudinal data should fit a simplex pattern in which temporally distal criterion predictors are more weakly related than temporally and theoretically proximal predictors. Although this was largely the case, it should be noted that intrinsic motivation at time 1 was more (rather than less) strongly related to performance at time 3 than were the more proximal mastery goals at time 2. However, this assumes that variance and levels of a construct are relatively stable, which was not the case in the current study. Or, it could be due to the fact that intrinsic motivation at time 1 was somewhat high: looking to times 2 and 3, the mean for intrinsic motivation is lower and the expected simplex pattern is observed. In addition, this pattern suggests that there may be an influence of intrinsic motivation independent of mastery goals or that the ordering of the mediator and the IV could be reversed. Further extending the number of capture points in future samples might help untangle this issue.

The usage of cumulative grade-point average (GPA) may suggest somewhat ambiguous conclusions, as it theoretically confounds previous achievement with current achievement. While it could be argued that the official performance measures should be restrained to a single class, some scholars (e.g., Magin & Helmore, 2001) have taken issue with the reliability of single-teacher ratings of student performance. Thus, while cumulative GPA may confound previous- with current-performance, single-teacher ratings may be no better because they could just as easily be prone to error.

Implications for Practice

Findings from the current study most readily generalize to the classroom. The more intrinsically motivated a student is, the more likely it is that he or she will report engaging in proactive study at any point in time. This suggests that educators will be highly likely to boost student participation and engagement by cultivating intrinsic (rather than extrinsic) motivation.

Also, these findings might be considered for discrete organizational training programs. Many organizational training programs now emphasize an active learner approach, in which trainees learn by doing. These programs are specifically aimed at developing adaptive expertise and target motivational components to improve a wide range of competencies (Bell & Kozlowski, 2010). Because these programs depend on deliberative practice for the attainment of expertise, they require trainees to be actively engaged in the training material. Findings from the current study suggest that in order for trainees to actively engage the material, trainers should structure their programs to support intrinsic motivation and mastery goals. Interested readers are referred to other applications of intrinsic motivation in the workplace (e.g., Deci, Connell, & Ryan, 1989; Gagne & Deci, 2005).

Implications and Future Directions for Research

Cross sectional designs do not permit the analysis of dynamic change over time, even though change is an implicit or explicit assumption in the vast majority of hypotheses in social science research. For this reason, some researchers even consider whether the vast majority of theories in the social and organizational sciences have ever been truly tested (Ployhart & Vandenberg, 2010). By utilizing advanced techniques such as path modeling with longitudinal data, the current study illustrates the utility of moving beyond cross-sectional data when causal or temporal inferences are required.

Future research should attempt to replicate and extend these findings using sufficiently large samples to fully test all hypotheses. Researchers should consider the use of different samples to generalize these findings to in a less lab-like setting because motivation and goal orientation may be differentially related to performance depending on the domain they are captured in. Emerging meta-analytic work indicates strong, positive relationships between intrinsic motivation and numerous criteria in multiple domains, such as sales performance, creativity performance, self-and supervisor-rated performance, physical activity or sports performance, training performance, and academic performance (Cerasoli et al., in press). In addition, future research should focus more closely on whether the performance criteria reflect quantity or quality. Although it was not possible to separate the two in the current study, there is strong reason to believe intrinsic and extrinsic motivation differentially effect quality and quantity performance (Cerasoli et al., in press).

Conclusion

Few studies have actually examined when or even WHY intrinsic motivation should predict performance in the first place. Despite the number of studies linking intrinsic motivation to performance and outcomes, the current study is among the first to provide strong explanatory links using longitudinal data in a naturalistic environment. Our findings suggest that intrinsic motivation predicts performance because intrinsically motivated individuals adopt mastery goals that predicate task enjoyment not through mere participation but through self-referential task improvement. Thus, it is not enough to be intrinsically motivated: the intrinsic satisfaction to be derived must come from self-improvement. The direct implication is that researchers, consultants, and educators might be more concerned with channeling, rather than boosting levels of intrinsic motivation.

AUTHOR NOTES

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