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Academic personal bests (PBs), engagement, and achievement: A cross-lagged panel analysis

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ABSTRACT

Using a cross-lagged analytic framework, the present study examined (1) the relative salience of prior academic personal bests (PBs) in predicting subsequent engagement and achievement compared with (2) the relative salience of prior engagement and achievement in predicting subsequent PBs. Academic PBs, engagement, and achievement measures were administered to 1866 high school students at two time waves across a one-year interval. Path models suggest the salience of prior academic PBs over subsequent engagement and achievement, and in some instances, evidence of reciprocal effects. The findings hold substantive, applied, and methodological implications for researchers and practitioners seeking to improve students' academic development through academic PBs.

1. Introduction

Academic personal bests (PBs) refer to personalized goals or standards of excellence that match or exceed one's previous best in the academic context. Adapting the concept from sports settings to the educational setting, Martin (2006) proposed that striving for PB-oriented goals can be a potentially effective approach to enhancing student academic trajectories and long-term academic development. In a cross-sectional study of 1016 students, utilizing self-report measures, Martin validated a model of academic PBs, comprising goals that are specific, challenging, competitively self-referenced, and self-improvement focused. He also demonstrated the positive yield of PBs pursuit for desirable school engagement, including educational aspirations, enjoyment of school, class participation, and persistence. Using a cross-lagged analytic framework, the present investigation aims to extend Martin's (2006) prior work by examining the effects of pursuing PBs, as an approach that students may adopt, on a wider set of subsequent engagement and achievement factors with a new and larger sample of students ($N = 1866$). Thus, the present study is important in that it sheds light on the relative salience of pursuing PBs in predicting engagement and achievement across time, and by implication, provides applied information for developing effective educational interventions that emphasize the pursuit of academic PBs.

1.1. Relevance of prior research to academic PBs

Martin (2006) maintained that pursuing academic PBs has the potential to facilitate and promote students' self-efficacy in learning (Bandura, 1997). This is so because performing as well or better than a previous performance is seen as accessible by students and this perceived accessibility to success enhances students' efficacy regarding their learning (Martin, 2006). Alongside heightened efficacy, Martin (2006) also proposed that pursuing academic PBs aligns with intrinsic motivation (Ryan & Deci, 2000) and 'flow' in learning (Csikszentmihalyi, 1990), two phenomena related to pursuing a level of challenge that optimally exceeds one's present capacity.

Academic PBs are also relevant to achievement goal theory, particularly to discussion on mastery and performance goals (Martin, 2006). PB goals comprise a personalized and self-improvement focus (consistent with mastery goals) and an element of (self) competition (consistent with performance goals). Thus, PBs may represent a type of goal that is an adaptive blend of both mastery and performance (see Pintrich, 2000 for further discussion on coordinating multiple goals).

1.2. The present investigation

Although offering important first insights into the effectiveness of pursuing PBs in the academic setting, Martin (2006) identified a number of limitations and directions for future research. First, the Martin study was cross-sectional (this study is longitudinal). Second, the study relied solely on self-reports of academic factors (this study includes 'objective' measures such as achievement). Third, the four PB goal dimensions proposed by Martin (2006) were highly correlated (up to $r = .93$), potentially leading to multicollinearity and his final

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analyses devolved to a single factor to deal with this (the present study adopts four self-improvement goal items from the Martin study that multidimensional scaling indicated best reflected a PB approach). We use the classic cross-lagged panel analysis (e.g., Huck, Cormier, & Bounds, 1974) to examine the effects (β coefficients) of T1 PBs on T2 engagement and achievement and the effects of T1 engagement and achievement on T2 PBs (see Fig. 1).

2. Method

2.1. Participants

The sample comprised 1866 students from six Australian high schools in the urban areas of Sydney. These students completed the measures at Time 1 (3rd term of the school year) and Time 2 (1 year later). Of the overall sample, 29% were in Grade 7 at Time 1 and Grade 8 at Time 2; 24% were in Grade 8 at Time 1 and Grade 9 at Time 2; 23% were in Grade 9 at Time 1 and Grade 10 at Time 2; 18% were in Grade 10 at Time 1 and Grade 11 at Time 2; and 6% were in Grade 11 at Time 1 and Grade 12 at Time 2. Two of the high schools were government schools and four were independent schools. The government schools included one comprehensive school of mixed ability and one academically selective school. The independent schools were fee-paying comprehensive schools with students who had a slightly higher aggregate ability level than the government schools. These schools, however, did not screen or select students on entry by ability such that the schools comprised students with a broad range of ability levels. Over half of the participants (61%) were male (the two largest schools in the sample were boys' schools). The average age of the participants were 13.86 years ($SD = 1.28$) at Time 1 and 14.79 years ($SD = 1.28$) at Time 2. Of the total sample, 81% were of an English speaking background and 19% were of non-English speaking background. The large sample size and the range of ability levels of the students participating in the study allow generalizability of the findings to high school students with a similar demographic background.

2.2. Measures

2.2.1. Academic PBs measure

Academic PBs were assessed by four self-improvement goal items in Martin's (2006) study (i.e., "When I do my schoolwork I try to do it better than I've done before"; "When I do my schoolwork I try to do the best that I've ever done"; "When I do my schoolwork, I try to improve on how I've done before"; "When I do my schoolwork I try to get a better result than I've got before"). Confirmatory factor analysis (CFA) suggested that the four items are best represented by a one-factor congeneric PBs model, as indicated by the following fit indices (for T1 and T2 respectively): Comparative Fit Index (CFI) = .99 and 1.00; Non-Normed Fit Index (NNFI) = .97 and .99; and Standardized Root Mean Square Residual (SRMR) = .02 and .01 (see Marsh, Hau, & Wen, 2004). Item factor loadings are sound and significant at $p<.001$, ranging between .81 and .87 for T1 measurement and between .79 and .87 for T2 measurement. Based on Cheung and Rensvold's (2002) cut-off value criterion for evidence of multi-group invariance (ΔCFI < .01), we found evidence that the one-factor PBs model was invariant for boys and girls (all ΔCFIs were <.01 for comparison between an unconstrained model and the models that each constrained factor loadings, uniquenesses, and factor variance) and predominantly invariant over time (ΔCFIs ranged between .00 and .02, with invariance in loadings–the minimum criterion for invariance [Marsh et al., 2004]–yielding ΔCFI < .01). Cronbach's alpha estimates and descriptive statistics for all the scales in the study are reported in Table 1.

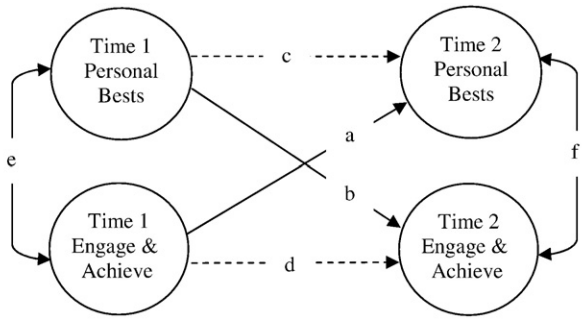

Fig. 1. Hypothesized cross-lagged relationships between personal bests and engagement and achievement. Note: "a" and "b" represent cross-lagged path coefficients between T1 PBs and a T2 engagement/achievement factor and between a T1 engagement/achievement factor and T2 PBs; "c" and "d" represent auto-lagged path coefficients for PBs and engagement/achievement factors, respectively; and "e" and "f" represent unlagged correlation coefficients between T1 PBs and a T1 engagement/achievement factor and between T2 PBs and a T2 engagement/achievement factor, respectively (note that "f" is the T2 correlation after controlling for factors' auto-lagged and cross-lagged effects in the model).

2.2.2. Engagement and achievement measures

Ten engagement and achievement measures, including the four examined in Martin's (2006) research, were included in the study. These comprised six self-report school engagement factors (see e.g., Fredricks, Blumenfeld, & Paris, 2004) and four 'objective' achievement measures. The engagement measures are as follows: educational aspirations (e.g., "I intend to complete school"); enjoyment of school (e.g., "I enjoy being a student"); class participation (e.g., "I get involved in things we do in class"); persistence (e.g., "If I can't understand my schoolwork at first, I keep going over it until I do"); disengagement (e.g., "I often feel like giving up at school"); and, homework completion (i.e., "How often do you do and complete your homework and assignments?"). The first five measures were rated on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*) and homework completion was assessed on a 1 (*never*) to 5 (*always*) rating scale. Achievement measures were collected through the Wide Range Achievement Test-3 (WRAT-3; Wilkinson, 1993). Four measures were derived here, all standardized by age: literacy performance, numeracy performance, literacy effort (how many literacy items attempted), and numeracy effort (how many numeracy items attempted).

2.3. Procedures

For each school, at each time wave, a designated classroom teacher was responsible for the administration of the questionnaire in class. The teacher first informed students that the purpose of the survey is to understand and help students enhance their academic motivation and improve their learning. Students were assured that their responses to the survey would not affect their school performance and that the data would be analyzed and reported collectively rather than individually. The teacher then explained the rating scale of the items and then presented a sample item. Students were instructed to complete the instrument independently and to provide only one answer for each item. Literacy and numeracy tests were administered after completion of the self-report survey items. Once all surveys were collated, the cover sheet (containing the name of the participants) was discarded and all completed surveys were assigned a unique identification number that could be used to identify responses for matching T1 and T2 data in longitudinal analyses. This unique identifier was also used to assure anonymity and confidentiality for all participants.

2.4. Statistical analysis

Descriptive statistics (mean, standard deviation), Cronbach's alpha internal consistency, and interrelationships of T1 and T2 PBs and engagement and achievement factors were first examined. Using