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# I believe, therefore I achieve (and vice versa): A meta-analytic cross-lagged panel analysis of self-efficacy and academic performance

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ABSTRACT

Self-efficacy has long been viewed as an important determinant of academic performance. A counter-position is that self-efficacy is merely a reflection of past performance. Research in the area is limited by unidirectional designs which cannot address reciprocity or the comparative strength of directional effects. This systematic review and meta-analysis considered both directions of the relationship simultaneously, pooling data from longitudinal studies measuring both academic self-efficacy and academic performance over two waves. Pooled correlations ($k = 11$, $N = 2688$) were subjected to cross-lagged path analysis that provided support for a reciprocal effects model. Performance had a net positive effect on subsequent self-efficacy ($\beta = 0.205$, $p < 0.001$), significantly larger than the effect of self-efficacy on performance ($\beta = 0.071$, $p < 0.001$). Moderator analyses indicated that reciprocity holds for adults, but not for children (in whom performance uniquely impacts subsequent self-efficacy beliefs, but not the reverse). Cross-lagged effects were stronger in studies which used methodologies consistent with recommendations of self-efficacy theorists.

## 1. Introduction

The non-intellective antecedents of student performance are of great interest to educators and education researchers (Robbins et al., 2004; Stankov & Lee, 2014), and research in this area is an important determinant of education policy (Bong, 2012; Pajares & Usher, 2008). One construct which has received a great deal of research attention is perceived self-efficacy – a core dimension of human agency widely believed to be positively related to academic success (Bandura, 1977, 1997; Bong, 2012; Pajares & Schunk, 2001). Self-efficacy refers to an individual's perception of their own capability to organise and execute required courses of action to achieve particular outcomes (Bandura, 1977, 1997). Self-efficacy is believed to enhance performance through a range of mechanisms: individuals with high levels of self-efficacy set more difficult goals, expend more effort, persist for longer with challenges, and show resilience in the face of adversity (Klassen & Usher, 2010). These achievements in turn are assumed to increase self-efficacy, which results in a self-fulfilling prophecy process (Bandura, 1977, 1997).

### 1.1. Self-efficacy → academic performance (I believe; therefore I achieve)

A vast body of research has explored the idea that self-efficacy is the antecedent in the relationship and exerts a positive motivational influence on performance (Honicke & Broadbent, 2016; Vancouver, Thompson, & Williams, 2001). Such research takes its lead from early studies by Bandura and colleagues (see Pajares, 1997; Zimmerman, 2000 for review), which demonstrated that self-efficacy influenced subsequent behaviour. Self-efficacy → performance research also draws on the definition of self-efficacy as a future-oriented, predictive construct: measures of self-efficacy involve statements of confidence in ability to achieve a future performance goal (Bong, 2012). From an applied perspective, research on this relationship draws impetus from (and feeds into) educational settings, in which interventions are sought to improve performance.

In a review of self-efficacy → performance research conducted over the past three decades, Klassen and Usher (2010) describe self-efficacy as a crucial and powerful influence on academic performance, accounting for approximately a quarter of the variance in outcomes. Self-

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efficacy is argued to rival previous performance and mental ability in its power to predict academic performance (Pajares & Kranzler, 1995). Meta-analyses of cross-sectional studies consistently point to self-efficacy as one of the strongest correlates of academic performance. Richardson, Abraham, and Bond (2012) found that self-efficacy was the strongest correlate of tertiary GPA (ρ = 0.59), exceeding high school GPA (ρ = 0.41), scholastic aptitude tests (ρ = 0.31–0.33), and intelligence (ρ = 0.21). Similar relationships are reported by Multon, Brown, and Lent (1991) and Honicke and Broadbent (2016).

Longitudinal research in the self-efficacy → academic performance paradigm is comparatively sparse (Honicke & Broadbent, 2016). Nonetheless, findings are consistent across school-aged and tertiary samples, in that self-efficacy positively predicts subsequent academic performance, over periods ranging from a single semester, to courses over several years (*rs* = 0.37–0.52; Chiang & Lin, 2014; Garriott & Flores, 2013; Majer, 2009; Parker, Marsh, Ciarrochi, Marshall, & Abduljabbar, 2014; Phan & Ngu, 2016).

Based on such findings, direct manipulation of self-efficacy has long been recommended as an intervention strategy in learning settings (e.g., Bong, 2012; Pajares & Usher, 2008; Zimmerman & Bandura, 1995). Given the practical implications for educational reforms and interventions, as well as the implications for theory and research, it is important to be confident that the relationship between self-efficacy and academic performance is being interpreted accurately (Valentine, DuBois, & Cooper, 2004).

### 1.2. Academic performance → self-efficacy (I achieve; therefore I believe)

As the bulk of research on the relationship between self-efficacy and performance is cross-sectional, inferences about the direction of influence are impossible (Honicke & Broadbent, 2016; Pajares & Usher, 2008). Some researchers argue that cross-sectional relationships reflect the influence of performance on subsequent self-efficacy, not the reverse (Shea & Howell, 2000; Vancouver et al., 2001). Heggestad and Kanfer (2005) argue that self-efficacy is simply a proxy for past performance with no unique predictive power.

There is little doubt that performance outcomes influence self-efficacy. Previous mathematics performance positively predicts mathematics self-efficacy in both school-aged and tertiary samples (e.g., Klassen, 2004; Matsui, Matsui, & Ohnishi, 1990). Chin and Kameoka (2002) reported that reading scores predicted the educational self-efficacy of high school students (β = 0.32) after accounting for a range of demographic and psychosocial predictors. In a recent study, both standardised test scores and first semester GPA correlated with self-efficacy 12 months later, *r* = 0.30 (Lee, Flores, Navarro, & Kanagui-Munoz, 2015).

Such findings are not inconsistent with self-efficacy theory; in fact, investigations of the academic performance → self-efficacy relationship often grow out of self-efficacy theory directly. Mastery experience (an individual's experience of performance success) is one of four posited sources of self-efficacy beliefs, along with vicarious experience, verbal social persuasion, and emotional physiological arousal (Bandura, 1997). Research shows that, of these four, mastery experience is the strongest (if not the only) predictor of self-efficacy (Britner & Pajares, 2006; Lent, Lopez, & Bieschke, 1991; Usher & Pajares, 2008).

While self-efficacy theorists do not discount the influence of performance on self-efficacy, they refute the argument that self-efficacy has no unique impact on performance (Bandura, 2012; cf. Heggestad & Kanfer, 2005). Some researchers have attempted to rule out the hypothesis that self-efficacy provides no incremental prediction of performance beyond that accounted for by previous performance, by meta-analysing the self-efficacy → performance relationship, controlling for previous performance. Valentine et al. (2004) used this approach, interpreting the unique self-efficacy → performance effect (β = 0.10, *k* = 9) as "small but noteworthy" (p. 127). Robbins et al. (2004) found that the prediction of academic achievement by academic self-efficacy was incremental to that of socioeconomic status, standardised achievement measures, and high school GPA (β = 0.20, *k* = 18).

The research summarised above provides evidence of both a self-efficacy → performance relationship and a performance → self-efficacy relationship; it also suggests that self-efficacy has an effect on subsequent performance incremental to that of previous performance alone. While this longitudinal research extends considerably on previous cross-sectional findings, it does not address the possibility that self-efficacy and performance are reciprocally related – nor does it elucidate the relative strength of directional effects.

### 1.3. A chicken-and-egg conundrum

The question of the direction of causality in the relationship between self-beliefs and academic performance has been described as one of "thorniest issues" in this area (Pajares & Schunk, 2001). According to social cognitive theory, self-efficacy exists in a framework of reciprocal determinism: behaviour both shapes, and is shaped by a range of interacting factors (Bandura, 1977, 1997). In this model, self-efficacy and performance modify each other iteratively within a constant feedback loop (Multon et al., 1991). In educational settings, learners reflect on their performance and use this information when formulating their self-efficacy beliefs, which then influence subsequent performance (Phan, 2012).

Several recent studies demonstrate increased interest in the mutual influences of self-efficacy and academic performance over time. In longitudinal studies of both high school and university students in which multiple measurements of self-efficacy and performance are staggered over several years, self-efficacy and performance predict each other, either in a self-efficacy → performance → self-efficacy pattern, or in a performance → self-efficacy → performance pattern (e.g., Caprara, Vecchione, Alessandri, Gerbino, & Barbaranelli, 2011; Hwang, Choi, Lee, Culver, & Hutchison, 2016). These types of designs provide evidence of positive mutual temporal effects, but by staggering data collection over time they do not enable the modelling of simultaneous reciprocal effects (Rogosa, 1988).

Thus, while reciprocal determinism between academic self-efficacy and academic performance may be considered a fait accompli (Lindsley, Brass, & Thomas, 1995), there is little direct empirical evidence which supports this proposition (Williams & Williams, 2010). This gap in the literature is likely due, in part, to the paucity of longitudinal studies in the area, a problem which is compounded because the two unidirectional research paradigms in this area are pursued largely independently of each other (Shea & Howell, 2000). In the most recent self-efficacy → performance meta-analysis, Honicke and Broadbent (2016) suggest a reciprocal relationship exists and recommend that this be investigated directly.

In the case of self-efficacy and performance, the issue of how to assess the unique influence of one variable on the other has been characterised by debate. Controlling for raw past performance (e.g., Feltz, 1982; Mitchell, Hopper, Daniels, George-Falvy, & James, 1994) is argued to be an over-correction (Bandura & Locke, 2003), while residualising self-efficacy from past performance (Bandura & Locke, 2003) is argued to lead to statistically artefactual results (Heggestad & Kanfer, 2005). In fact, as both past self-efficacy and past performance are expected to be covarying common-cause variables (Bandura, 2012; Feltz, Chow, & Hepler, 2008; Heggestad & Kanfer, 2005; Vancouver et al., 2001), any unidirectional approach will result in inflated estimates of the influence of these variables on each other (Brown et al., 2008). An approach is required where both self-efficacy and performance can be controlled at time 1 (Bandura, 2012; Feltz et al., 2008).

One approach that may overcome these limitations is cross-lagged panel analysis (CLPA; see Fig. 1); a uniquely powerful approach to chicken-and-egg questions (Singh & Tyagi, 2014) which has been gaining traction in the behavioral sciences literature (e.g., Riketta, 2008). CLPA provides more robust evidence of potential reciprocal