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RESEARCH NOTE

Prediction of Postgraduate Performance from Self-Efficacy, Class of Degree and Cognitive Ability Test Scores

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Abstract

The study examined the predictive validity of variables used to select graduate students onto a postgraduate degree course. One hundred and forty-five postgraduate students completed a cognitive ability test (MD5, Mental Ability Test), a questionnaire to assess perceptions of self-efficacy to succeed on the programme, and reported their performance on their first (undergraduate) degree. Students completed these measures at the start of the degree. The degree comprised 12 modules, which all students were required to complete successfully. Multiple regression results showed that 32 per cent (Multiple $R = .56$, $R^2 = .32$, $p < .01$) of the variance in postgraduate performance could be explained significantly by variations in class of degree, cognitive ability, and self-efficacy scores. It is suggested that future research should investigate the effectiveness of interventions designed to enhance performance through raising self-efficacy.

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Keywords: self-efficacy, motivated behaviour, performance, education

Introduction

Recent research has investigated the extent to which measures taken during admission and at induction are associated with performance on postgraduate degree courses (Lane and Lane, 2002). Lane and Lane (2002) used three variables to predict performance, namely undergraduate degree classification, cognitive ability test scores, and self-efficacy scores. They found that high cognitive ability test scores were associated with postgraduate success among a sample of 303 students. Undergraduate degree classification and self-efficacy scores showed no significant relationship with performance. As research is proposed to inform practice, evidence should be corroborated before being used to inform practice. Therefore, the purpose of the present study was to cross validate findings of Lane and Lane (2002) to a different sample.

UK admission criterion for postgraduate courses is typically determined by undergraduate performance; the assumption being that performance at undergraduate level will be associated with postgraduate performance. Lane and Lane (2002) found evidence to question this assumption. Thus, given the wide scale usage of undergraduate performance in selection, there is a need to re-investigate the association between undergraduate and postgraduate performance to see if the findings of Lane and Lane (2002) can be replicated.

Standardised tests of cognitive ability typically form an important part of admission criteria for postgraduate courses in the United States (Norcross et al., 1996). Meta-analysis results have shown cognitive ability tests relate significantly with subsequent performance (Kuncel et al., 2001), although other meta-analysis studies have pointed toward different conclusions (Morrison and Morrison, 1995). Thus, equivocal evidence suggests that Lane and Lane's (2002) findings could be an anomaly, and there is therefore, a need to re-investigate whether cognitive ability tests scores could predict performance on a different sample.

Thirdly, Lane and Lane (2002) investigated relationships between self-efficacy and performance. Self-efficacy is theorised to predict how much effort will be applied to attain a performance outcome (Bandura, 1997). Previous research has shown evidence of the predictive validity of self-efficacy in academic settings (Brosnan, 1998; Lane and Lane, 2001; Newby-Fraser and Schlebusch, 1998; Manstead and Van-Eekelen, 1998; Pajares, 1996; Vrugt et al., 1997; Wolters and Pintrich, 1998). Lane and Lane (2001) found that self-efficacy scores significantly predicted academic performance among a sample of 76 postgraduate students. Lane and Lane (2001) suggested that evidence showing significant relationships could form the basis for designing interventions designed to improve performance, a suggestion not supported in their later paper.

Given the emphasis on class of degree in terms of selection, unclear findings for relationships between cognitive ability test scores and performance, and previous research showing self-efficacy has significantly predicted performance, future research should cross-validate Lane and Lane's (2002) findings to a different sample. Cross-validation of research seems particularly apt for research conducted in real-world settings where it is difficult to control variables that might threaten internal validity. Thus, the present study replicated methods used by Lane and Lane (2002) for the purpose of testing the predictive effectiveness of undergraduate degree classification, scores on a cognitive ability test, and self-efficacy scores on postgraduate performance taken as the average mark from modules over a degree.

Method

Participants

Participants were 145 postgraduate students studying for a Master of Arts Degree in Human Resource Management. Participants ranged in age from 21 to 52 years ($M = 28.50$ yr.; $SD = 5.66$ yr.; Male = 46; Females = 99). Participants were drawn from part-time courses ($n = 18$), and from full-time courses ($n = 127$).

Measures

Measures in the present study replicated those used by Lane and Lane (2002). Class of undergraduate degree was assigned the following values: first class Honours = 5; upper second class Honours = 4; lower second class Honours = 3; third class Honours = 2; pass degree = 1. Higher National Diploma (HND) and Higher National Certificate (HNC) qualifications were classified as a pass degree. Individuals with no degree were assigned the value zero.

We assessed cognitive ability using the MD5¹. The MD5 is a standard commercially available test used extensively in management selection. It comprises 55 questions involving numerical and verbal reasoning to be answered in 15 minutes. Fifteen items assess vocabulary / semantic relationships, and sixteen items assess symbol relationships-answers as words or parts of words. There are 14 questions involving arithmetic relations and number / word relations. In terms of construct validity, the Test Agency manual reports MD5 scores ($p < .001$) correlate significantly with the AH4 Intelligence Test (Heim et al., 1970). MD5 scores also correlate significantly with the Watson-Glaser Critical Thinking Appraisal (Watson and Glaser, 1964).

Self-efficacy was assessed using the magnitude and strength towards academic performance. There were four self-efficacy statements on which students rated their confidence on a scale of 1 (no confidence at all) to 10 (100 per cent confident). Self-efficacy questions were:

1. How confident are you that you will complete each assignment first time?
2. How confident are you that you will attain average marks of 70%?
3. How confident are you that you will attain average marks of 60-69%?
4. How confident are you that you will pass the course (marks over 50%)?

Using the .70 criterion proposed by Tabachnick and Fidell (1996), alpha coefficients for the four-item scale were acceptable ($\alpha = .79$); a figure consistent with that previously reported for the same scale previously ($\alpha = .76$, Lane and Lane, 2002).

Performance was assessed using the average mark over 12 modules. Marks are awarded on a 20-point scale where a score of 1 represents the highest mark and 20 the lowest mark. Students' work was marked, second-marked, and internally and externally moderated following university procedures.

Procedure

Within the first two weeks of teaching, participants were asked if they would participate in a project to investigate selection / admission procedures. Students were told that their participation was entirely voluntary. Participants were asked to be realistic and to think carefully before completing the self-efficacy measures. Students completed the cognitive ability test under examination conditions.

Results

Descriptive statistics and a correlation matrix are contained in Table 1. Results show that self-efficacy, class of degree, and cognitive ability test scores correlated significantly with postgraduate performance. The direction of relationships showed that as academic marks improved (as indicated by

¹ The MD5 can be purchased from the Test Agency, Henley-on-Thames, Oxfordshire, England, UK.

lower scores), self-efficacy and cognitive ability scores also tended to increase. Further, results show that good degree classifications at undergraduate level were associated with achieving good grades at postgraduate level. Self-efficacy and class of degree each explained 6 per cent of the variance in performance ($r^2 = .06$). Cognitive ability significantly explained 24 per cent of the variance in academic performance ($r^2 = .24$).

Multiple regression was used to investigate the amount of variance that could be explained collectively from the three predictor variables. Regression results showed that 32 per cent (Multiple R = .56, $R^2 = .32$, $p < .01$) of the variance in postgraduate performance could be explained significantly by variations in class of degree, cognitive ability, and self-efficacy scores. Multiple regression results show that the collective variance explained was similar to the sum of correlations, hence suggesting that each predictor variable accounted for a unique proportion of performance variance.

	M	SD	UG degree	Cognitive Ability	MA Performance
Self-efficacy	25.37	4.99	.18**	.05	-.24*
Undergraduate degree	3.10	1.17	1.00	.09	-.24*
Cognitive Ability	33.67	8.73		1.00	-.49*
MA performance	7.79	2.38			1.00

* $p < .01$

** $p < .05$

Table 1: Descriptive statistics and correlation matrix for relationships between undergraduate degree, cognitive ability test scores, and postgraduate degree performance

Discussion

The present study investigated the relationship between variables assessed at the start of a postgraduate course and subsequent performance. Results of the present study support the findings of Lane and Lane (2002) in terms of the relationship between cognitive ability test scores and performance. In contrast to the findings of Lane and Lane (2002), results of the present study show significant relationships between class of undergraduate degree and postgraduate performance. Findings also show significant relationships between self-efficacy and postgraduate performance. The contrasting findings between the two studies highlight the value of cross-validating findings.

Findings of the present study lend support to the assumption that undergraduate performance is associated with success at a postgraduate level. Results indicated that students with a first class or upper second class undergraduate degree classification tended to achieve good postgraduate grades. By contrast, performance among students with a lower second class, third class, or lower qualification varied greatly. For example, an analysis of performance scores for these students indicated that some achieved very high grades and other students achieved very low grades. This suggests that students with lower second-class degrees or lower reduced the strength of the overall correlation coefficient. Therefore, although the strength of the correlation was weak, there was general support for the notion that students achieving a first class or upper second class degree classification cope effectively with the demands of postgraduate study. It is possible that the findings of Lane and Lane (2002) could be ascribed to students with poor undergraduate degrees influencing the strength of the overall correlation. Evidence suggests that among these students, cognitive ability might be the salient factor. Clearly, future research investigating performance among students with poor qualifications at admission should use a qualitative research design. We suggest that using a qualitative research design might enable exploration of factors unique to individuals that influence performance.

Results of the present study show that scores on the MD5 test (cognitive ability) had the strongest relationship with performance; a finding that is consistent with previous research in academic settings

in the US (Kuncel et al., 2001). Psychometric tests are not typically used in educational settings in the UK, even though they are typically used in commercial settings as part of selection procedures (Kanfer et al., 1995; Matthews, 1997; Wagner, 1997). Thus, cognitive ability tests might have appeal to Course Leaders who could consider using them as part of the selection process. This seems particularly relevant to courses with an applied or vocational focus, such as a Masters degree in an applied subject such as leisure, sport, and tourism. A Master's degree course in an applied subject may recruit managers from industry and there are a great many managers without an undergraduate degree. In short, there exists a pool of potential students who do not hold an undergraduate degree, but with sufficient work related experience that applies directly to the content of the course.

Research has suggested that cognitive ability test scores should be supplemented with measures of motivation (Wagner, 1997). In the present study, self-efficacy was used as an index of motivation. Results indicating that self-efficacy significantly predicted performance are consistent with previous research (Brosnan, 1998; Lane and Lane, 2001; Newby-Fraser and Schlebusch, 1998; Manstead and Van-Eekelen, 1998; Pajares, 1996; Vrugt et al., 1997; Wolters and Pintrich, 1998).

The relatively weak self-efficacy and performance relationship could be partially ascribed to the measure of self-efficacy used. Bandura (1997) argued that there should be concordance between self-efficacy measures and the behaviours needed for success. Lane and Lane (2001) developed a specific self-efficacy measure by using qualitative methods to explore the competencies that individuals from the group under investigation perceived as being needed for success. The resultant competencies included coping with the intellectual demands of the programme, making sufficient effort, and managing time (Lane and Lane, 2001). They found that self-efficacy measures developed using this process significantly predicted postgraduate performance. A limitation of the self-efficacy measure used in the present study is that it focused on confidence to attain levels of achievement, rather than focusing on confidence in being able to deliver the skills needed to produce that achievement. We suggest that future research should follow Bandura's (1997) recommendations that self-efficacy measures should be developed through a thorough examination of the competencies needed for delivering actual performance.

It is suggested that findings from the present study could be used to guide intervention strategies designed to identify students at risk of failing. It would appear that students with an undergraduate degree of lower second class or lower, with low cognitive ability scores and low self-efficacy scores are particularly at risk. As self-efficacy was assessed at the start of the course, there should be sufficient time to implement an intervention programme to bring about increased self-efficacy. This type of strategy has been used effectively in industrial settings (Wolfe et al., 1998).

Conclusion

In summary, the present study examined the predictive effectiveness of degree classification, cognitive ability and self-efficacy in a sample of post-graduate Master's degree students. Future research should investigate the effectiveness of applied interventions designed to increase self-efficacy and bring about improved performance.

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