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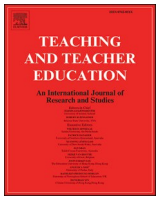

Research paper

Perceived autonomy support as a predictor of rural students' academic buoyancy and academic self-efficacy

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A B S T R A C T

Students' academic self-beliefs are associated with their school achievement and enjoyment. However, academic self-beliefs appear to be lower in rural schools. In a sample of students in Australian rural schools ($N = 974$), this study investigated whether perceived autonomy support (PAS) predicted two important self-belief constructs: academic buoyancy and academic self-efficacy. The results revealed that PAS positively predicted academic buoyancy and academic self-efficacy. Multigroup structural equation modeling further identified that primary school students reported more adaptive school experiences than high school students. This research has implications for how teachers can best support students' academic self-beliefs in rural schools.

1. Introduction

In many countries there are significant gaps in the educational outcomes between students living in rural and metropolitan areas, including academic achievement in standardized tests (Organisation for Economic Co-operation and Development [OECD], 2018) and student expectations of completing a university degree (Echazarra & Radinger, 2019). Students' academic self-beliefs are implicated in these disparities, as students' self-beliefs are associated with their academic achievement (Honicke & Broadbent, 2016; Talsma et al., 2018; Valentine et al., 2004) and positive intentions to continue their education (Lamb et al., 2020; Martin, 2009). Students' academic self-beliefs also generally decrease the further remote a school (Thomson et al., 2020; Young, 2000).

Teachers' interpersonal motivating styles may offer ways to support students' academic self-beliefs. Autonomy support is one such motivating style that focuses on nurturing students' internal motivation, instead of relying on external pressures and rewards to influence student behavior (Reeve, 2016). When students perceive autonomy support from their teachers, they also experience greater internal motivation and engagement (Jang et al., 2016) and academic achievement (Schuitema et al., 2016). Perceived autonomy support (PAS) is also thought to be predictive of self-belief constructs such as academic buoyancy (Tarbetsky et al., 2017) and academic self-efficacy (Uçar & Sungur, 2017). Academic buoyancy refers to students' perceived ability to "effectively deal with setback, challenge, adversity, and pressure in the academic setting" (Martin & Marsh, 2008b, p. 172). This represents how well students can manage the daily challenges of school, including experiencing failure and academic difficulties. On the other hand, academic self-efficacy refers to students' confidence in their ability to perform well at academic tasks (Chemers et al., 2001). This represents students' self-beliefs about their ability to successfully complete work and assessments. PAS may foster both academic buoyancy and academic self-efficacy because it nurtures students' psychological needs and self-beliefs (Ryan & Deci, 2000; 2017).

Autonomy support has received considerable supportive evidence across the literature as an adaptive teaching approach (Reeve & Shin, 2020; Ryan & Deci, 2017). However, fewer studies have investigated PAS in rural educational contexts (Simões & Calheiros, 2023). The uniqueness of rural education has often been neglected in the wider literature (Roberts & Fuqua, 2021), which has led to criticisms of research as reinforcing a metropolitan norm (Roberts & Guenther, 2021) and tending to not consider the contextual specificity of this research population (Roberts, 2014). However, PAS may be particularly important for nurturing academic self-beliefs in rural settings (Karlberg-Granlund, 2023). Some teachers in rural schools have reported that national curriculums are perceived to be less relevant to both students and communities in rural areas (Lock et al., 2012; Papatraianou et al., 2018). Notably, one aspect of autonomy supportive teaching is communicating task relevance to students to help foster intrinsic motivation (Reeve, 2016), which may help rural students to identify personal value in their learning (Hardre & Reeve, 2003). Thus, the extent to

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which PAS predicts academic buoyancy and academic self-efficacy in rural contexts is an important area of research.

There is also a need to investigate potential differences in these factor associations for students in different school-stage settings, such as primary, high, and central schools. Central schools in New South Wales (NSW), Australia serve students of both primary and high school ages, and are more prevalent in rural and regional areas, where school sizes can be much smaller (Halsey, 2018). Some research has suggested that PAS is experienced at higher levels by younger students (Gillet et al., 2012), but it is not known if this motivating style plays a stronger role for student self-beliefs when students are younger and have fewer academic experiences. Additionally, primary school students usually spend more time with one main teacher throughout a school year, which may implicate the role that PAS plays towards students' self-beliefs.

The aim of the current research was to examine the extent to which PAS predicts academic buoyancy and academic self-efficacy, using data from a sample of students in rural schools in NSW, Australia. It was hypothesized that PAS would have strong positive associations with academic buoyancy and academic self-efficacy. Further, it was hypothesized that academic buoyancy would partially mediate the association between PAS and academic self-efficacy. This research also examined potential differences in these construct associations between students in different school-stage settings. The sample included students in primary (ages 9–14), high (ages 12–17), and central schools (ages 10–17). This research is significant because it explored the importance of autonomy support across distinct rural school-stage settings.

1.1. Rural perspective

In this research, rural contexts are understood as unique social settings in which students' academic buoyancy and academic self-efficacy are formed and enacted. Such a focus may help better understand the educational development of rural students, and better develop policies and practices that can lift student achievement relative to their context (Roberts & Fuqua, 2021). Autonomy support may be particularly effective in rural contexts, as it focuses on teachers nurturing students' autonomous motivation to learn (Karlberg-Granlund, 2023). We acknowledge that a potential limitation in the present study may be that "academic study" is seen by educational policy and research as value neutral, when instead it may be deeply rooted in context and family background. While testing such theories is beyond the scope of the current study, this study may gesture to some differences that are worth exploring from that perspective. Importantly, different levels of academic buoyancy and academic self-efficacy should not be inadvertently constructed as deficits when compared to a metropolitan norm, but rather understood as potentially different and distinct in rural contexts.

1.2. Theoretical framework

Social cognitive theory (Bandura, 1986) was used as the theoretical framework for the current study. Self-efficacy plays a pivotal role in social cognitive theory as a precursor of agentic behavior and optimal engagement, as people are more inclined to participate in activities in which they feel they will experience success (Bandura, 2001). Bandura defined self-efficacy as "people's beliefs in their capabilities to produce given attainments" (Bandura, 2006, p. 307). The origins of self-efficacy beliefs are thought to reside within a triadic model of reciprocal interactions between environmental, cognitive/personal, and behavioral factors (Bandura & Jourden, 1991). In education studies, the triadic model is often used to examine how students' self-efficacy and inner resources (i.e., cognitive/personal factors) mediate the associations between classroom support (i.e., environmental factors) and engagement and achievement outcomes (i.e., behavioral factors; Burns et al., 2018; Schunk & Mullen, 2012). In the current study, this theoretical framework was used to examine perceived autonomy support (i.e., an environmental factor) as a predictor of students' academic buoyancy and academic self-efficacy (i.e., cognitive/personal factors).

1.3. Autonomy support

Teachers' interactions with students are thought to be instrumental in the development of academic self-beliefs (Burns et al., 2018). Recent research has identified two distinct forms of motivating styles that teachers use in the classroom that are implicated in students' classroom functioning and cognitive appraisals: controlling and autonomy supportive styles (Reeve, 2016). In controlling styles, the teacher makes external motives more salient to influence student behavior, such as using demanding tones and using rewards and punishments like merits and detentions. In contrast, autonomy supportive teaching styles focus on nurturing students' internal drives to engage in learning. This is done through providing rationales for classwork, listening to students' perspectives, providing meaningful choices for how classwork is done, and encouraging questions (Reeve & Shin, 2020). *Perceived autonomy* support (PAS) refers to students' perceptions that their teachers support their autonomy and self-determination. PAS may be particularly important for students in rural schools because it encompasses identifying learning relevance (Hardre & Reeve, 2003; Karlberg-Granlund, 2023). Teachers in rural contexts in Australia have expressed difficulties in needing to adapt national curriculum topics to be relevant to their students (Lock et al., 2012; Papatraianou et al., 2018). If students do not find their work relevant, then this can affect their motivation, engagement, and achievement (Reeve, 2012).

1.4. Academic buoyancy and the predictive role of perceived autonomy support

Academic buoyancy refers to students' ability to handle the day-to-day challenges they experience at school (Martin & Marsh, 2008b). Academic buoyancy is related to but distinct from academic resilience, which describes students' resilience to more severe adversities, such as poverty (Das, 2019; Rojas Flórez, 2015). In contrast, academic buoyancy focuses on challenges and setbacks that most students frequently experience at school, such as critical feedback, heavy school workloads, and difficult to understand concepts (Martin & Marsh, 2009). Academic buoyancy may be particularly relevant to students in rural settings because these students generally experience lower academic achievement (OECD, 2018) and thus may face academic setbacks more often.

PAS may predict greater academic buoyancy, although this association has yet to be empirically tested. Granziera et al. (2022) identified that instrumental teacher support (i.e., the provision of instrumental resources and practical help) predicted greater academic buoyancy in samples of both high school students in Singapore and primary school students in Australia. PAS may play a similar role because of its focus on providing rationales and encouraging questions. Additionally, Tarbetsky et al. (2017) hypothesized that PAS may nurture academic buoyancy by fostering positive teacher-student relationships. PAS may also nurture academic buoyancy through helping students to focus on personal relevance in learning. When students engage in classwork for autonomous reasons, instead of external reasons, they are more likely to focus on mastering new skills (Benita et al., 2014) and may feel more resilience because challenge is a part of the learning process (Dweck & Master, 2007). Thus, in the current research, we hypothesized that PAS would predict greater academic buoyancy.

A recent longitudinal study by Bostwick et al. (2022) questioned the direction of the association between teacher support-related factors and academic buoyancy. Their results demonstrated that academic buoyancy at Time 1 predicted teacher learning support (i.e., perceptions of teachers' academic support and care) at Time 2 a year later, but this association was not reciprocal. The authors noted that this unexpected finding may have occurred because of the dynamic relationships between students and teachers, in which students can influence their teachers as well as their own perceptions of their learning environments

(Bostwick et al., 2022; Nurmi & Kiuru, 2015). Another explanation may be that students often have different teachers across school years, which may influence their perceptions of teacher support. In Bostwick et al.'s (2022) study, learning support at Time 1 was more strongly correlated with academic buoyancy at Time 1 than with academic buoyancy at Time 2 a year later when the students may have different teachers. Although more longitudinal research is needed to further explore the direction of such associations, there may be substantive benefits to investigating PAS as a predictor of academic buoyancy. This is because teachers can be trained to be more autonomy supportive through intervention, which can result in both short and long-term improvements in student outcomes (Reeve et al., 2019).

1.5. Academic self-efficacy and the predictive role of perceived autonomy support and academic buoyancy

Academic self-efficacy refers to a student's confidence that they will be successful in academic tasks at school (Bandura, 2001; Valentine et al., 2004). Although students can hold distinct self-efficacy beliefs towards individual school subjects, Green et al. (2007) demonstrated that there is significant shared variance across academic domains. Academic self-efficacy is associated with many positive student outcomes that are pertinent to students in rural areas, including academic achievement (Multan et al., 1991; Valentine et al., 2004; Weiβenfels et al., 2023) and future study intentions (Bong, 2001; Martin, 2009). Wettersten et al. (2005) found that the academic self-efficacy of high school students in rural schools in the US was predictive of both career and academic outcome expectations and of school engagement. Similarly, in a sample of high school students in rural schools in the US, Hardre and Reeve (2003) identified that perceived competence (a factor related to self-efficacy) was a significant predictor of students' intentions to persist at school. Thus, academic self-efficacy appears to be an important outcome for students in rural areas.

Academic buoyancy may predict greater academic self-efficacy. In Bostwick et al.'s (2022) longitudinal study, academic buoyancy was found to be a significant predictor of students' perceived academic confidence (which is related to academic self-efficacy) a year later, but this association was not reciprocal. Other cross-sectional studies have provided support that academic buoyancy can indirectly predict academic achievement via academic self-efficacy (Weiβenfels et al., 2023) and related constructs such as academic self-concept (Colmar et al., 2019). Although it is likely that academic buoyancy and academic self-efficacy are reciprocal in nature (Martin et al., 2010), it is meaningful for educators to understand the predictive role that academic buoyancy plays towards academic self-efficacy. This is because school experiences involve innate challenges that could shape students' academic self-efficacy. Experiencing challenges and learning from failure is a core part of the learning process (Tawfik et al., 2015). Academic buoyancy may help students to view challenges as opportunities to learn, instead of as indicators of failure (Dweck & Master, 2007) and protect students' academic self-efficacy in the face of adversity (Martin & Marsh, 2020; Weiβenfels et al., 2023). Therefore, in the current study, we hypothesized that academic buoyancy would predict greater academic self-efficacy.

PAS has also been shown to predict greater academic self-efficacy (Gutiérrez & Tomás, 2019; Zhao & Qin, 2021), as well as related constructs like perceived competence in rural school settings (Zhou et al., 2009). PAS may nurture academic self-efficacy because it is associated with student engagement (Cheon et al., 2016) and academic achievement (Jang et al., 2012). Autonomy supportive teaching may help draw attention away from peer comparisons (Burns et al., 2017) and instead help students to focus on their own personal accomplishments. In the current research, we hypothesized that PAS would predict greater academic self-efficacy, both directly (Gutiérrez & Tomás, 2019; Zhao & Qin, 2021) and indirectly via academic buoyancy (Granziera et al., 2022; Weiβenfels et al., 2023).

1.5.1. Associations between perceived autonomy support, academic buoyancy, and academic self-efficacy across different school-stage settings

It is also worth considering whether the role that PAS plays towards students' academic buoyancy and academic self-efficacy differs for students in different school-stage settings, such as primary, high, and central schools. In general, older students perceive their teachers to be less autonomy supportive (Gillet et al., 2012; Kleinkorres et al., 2023; Waxman & Huang, 1998). This may be because primary school students spend more time with one teacher than do high school students, allowing primary school teachers to better know their students and provide individualized support (Lester & Cross, 2015). There is also often more emphasis on discipline and controlling teacher behaviors in high school settings (Bergin & Bergin, 2009; Lewis, 2006), despite adolescents having greater desire for autonomy that is often not met at school (Mahatmya et al., 2012). This has been described as a misfit between adolescents' needs and their learning environments (Booth & Gerard, 2014; Eccles et al., 1993).

Although PAS is generally experienced at lower levels in high schools, it is not known if it plays a larger role in developing students' academic self-beliefs in either primary or high school settings. On one hand, PAS may be particularly important for younger students' academic buoyancy and academic self-efficacy because younger students' self-beliefs can be more malleable (Martinek & Kipman, 2016). Students in primary school have less academic experience and interact with fewer teachers, and therefore the autonomy support they receive may be particularly important for developing their academic self-beliefs (Skinner et al., 1998). On the other hand, PAS may be particularly salient for high school students because older students generally experience less of this type of support (Gillet et al., 2012; Kleinkorres et al., 2023; Waxman & Huang, 1998), yet developmentally desire greater autonomy (Mahatmya et al., 2012). Research findings are mixed in this area. In a comparison between middle school (i.e., early high school) and primary school students' experiences, Lei et al. (2018) found teacher support had a stronger association with negative academic emotions and a weaker association with positive academic emotions for middle school students, which may implicate other academic self-belief constructs. Due to these mixed findings, we investigated whether the associations between PAS, academic buoyancy, and self-efficacy differed for students in different school-stage settings as an open research question.

Academic buoyancy's role towards academic self-efficacy may also differ for students in different school-stage settings. As mentioned, younger students' academic self-beliefs are likely more malleable because they have less school experience (Martinek & Kipman, 2016). Academic buoyancy may therefore be critical for younger students to positively evaluate their abilities in the face of challenge (Colmar et al., 2019). However, academic buoyancy may also be particularly important for high school students' academic self-efficacy because older students may experience less positive and individualized support from their teachers (Gillet et al., 2012; Kleinkorres et al., 2023; Lester & Cross, 2015; Waxman & Huang, 1998), alongside increasing academic pressure related to end of school examinations (Granziera et al., 2022). Thus, it is not known if academic buoyancy is more or less salient to academic self-efficacy across different school-stage settings. In the current study, we investigated potential differences in the role that academic buoyancy plays towards academic self-efficacy in different school-stage settings as an open research question.

There is currently scant research on these constructs for students in central schools because central schools are particular to the NSW context (Boylan, 1988). There are less than 70 central schools in NSW and most research on these schools has focused on the experiences of principals and teachers (Green, 2008; Handal et al., 2018; Pietsch & Williamson, 2008). However, since central schools serve both primary and high school-aged students, exploring these school contexts may help to disentangle whether student age and the school learning environment are implicated in the role that PAS plays towards students' self-beliefs.

1.6. Age, gender, and socioeconomic status

Three student demographic covariates were used as statistical controls in the current study: age, gender, and socioeconomic status (SES). Student age can be predictive of PAS (Gillet et al., 2012; Kleinkorres et al., 2023; Waxman & Huang, 1998), academic buoyancy (Martin et al., 2010), and self-efficacy (Pajares et al., 2007; Watt, 2004; Wigfield & Eccles, 1994), with younger students often experiencing more adaptive school experiences. Female students have also been shown to report greater PAS (Lietaert et al., 2015). For student self-beliefs, some research suggests male students report greater academic self-efficacy, though this varies across subject domains (Huang, 2013). In Australia and other countries, male students are more likely than female students to be disengaged, experience high levels of anxiety, and achieve lower academic outcomes (Centre for Education Statistics and Evaluation [CESE], 2017; Lietaert et al., 2015). Regarding SES, there is evidence that teachers in lower SES areas (in comparison to higher SES areas) may have lower beliefs about their students' capacities (Archambault et al., 2012; Beswick et al., 2019; Solomon et al., 1996), which may implicate teachers' motivating styles and students' academic self-beliefs. Additionally, students from lower SES backgrounds may experience different forms of disadvantage that implicate their educational progress and school experiences (Rosenthal, 1998). Thus, it is important to account for these three demographic covariates.

1.7. Research purpose and aim

The aim of the current study was to examine the extent to which perceived autonomy support (PAS) predicts academic buoyancy and academic self-efficacy for students in rural schools. We also examined whether academic buoyancy partially mediates the associations between PAS and academic self-efficacy. Further, we examined whether these statistical associations varied for students in different rural school-stage settings, including primary, high, and central schools. A unique aspect of this study is its sole focus on non-metropolitan students and schools.

2. Methods

2.1. Participants

The dataset for this study was collected as a part of a larger study across 17 schools (Rural and Regional Education Project; Beswick et al., 2023). Ethics was approved by the ethics committees of both the university (HC200613) and the NSW Department of Education. The 17 schools were selected by convenience sampling. Consent to participate in the study was received from both students and their parents. Only 16 of the 17 schools participated in the student survey. The sample for this study included 974 students across 16 government schools in outer regional and remote areas in New South Wales (NSW) in Australia (Australian Bureau of Statistics, 2021). The 16 schools had index of community socio-educational advantage (ICSEA) scores—which is indicative of SES—below the national average. Seven schools were within 1 standard deviation (*SD*) below the national average, seven schools were between 1 and 2 *SD* below the national average, and two schools were between 2 and 3 *SD* below the national average. Seven were primary schools (student sample = 263), three were high schools (student sample = 523), and six were central schools (student sample = 188).

The students were in Year 5 (19.9%), Year 6 (15.2%), Year 7 (18.8%), Year 8 (16.0%), Year 9 (12.7%), Year 10 (10.2%), Year 11 (4.3%), and Year 12 (2.8%). Only 0.6% of students did not provide their year group. The mean age was 13.4 years old. Male students represented 46.5% of the sample, female students represented 50.2%, 1.4% identified as "other" as their gender, and 2.0% did not disclose their gender. Students who identified as Aboriginal represented 27.9% of the sample, 0.9% identified as Torres Strait Islander, 4.4% identified as both Aboriginal and Torres Strait Islander, and 2.3% did not respond about their Aboriginality. Students who spoke a language other than English at home represented 7.3% of the sample, with missing data representing 2.2% in this variable. Most of the sample had attended preschool (88.3%), with 2.2% not responding to this item.

2.2. Measures

Data were collected using student self-report surveys. All measures were collected in the same survey. The students completed printed versions of the survey at their school, which were then returned to the researchers and converted into a digital format for analysis. The measures included in this study are described below.

2.2.1. Perceived autonomy support

Perceived autonomy support (PAS) was measured using an adapted version of the short Learning Climate Questionnaire (Williams & Deci, 1996). Students responded to six items on a 7-point Likert-like scale ("strongly disagree" to "strongly agree"). The items asked students the degree to which they agreed that their teachers use autonomy supportive approaches and practices (example item: "My teachers try to understand how I see things before suggesting a new way of doing things"). The short version of the Learning Climate Questionnaire has demonstrated appropriate reliability and construct validation in previous research (Jang et al., 2012). In the current study the scale demonstrated adequate internal reliability ($\alpha = 0.94$).

2.2.2. Academic buoyancy

Academic buoyancy was measured using the Academic Buoyancy Scale (Martin & Marsh, 2008b). Students responded to four items on a 7-point Likert-like scale ("strongly disagree" to "strongly agree"). The items asked students the degree to which they agreed that they could handle the day-to-day challenges experienced at school (example item: "I think I'm good at dealing with schoolwork pressures"). The Academic Buoyancy Scale has demonstrated appropriate reliability and construct validation in previous research (Martin & Marsh, 2008a). In the current study the scale demonstrated adequate internal reliability ($\alpha = 0.85$).

2.2.3. Academic self-efficacy

Academic self-efficacy was measured using the Academic Self-Efficacy Scale (Chemers et al., 2001). Students responded to eight items using a 7-point Likert-like scale ("never true" to "always true"). The items asked students how true they believed statements to be about their abilities at academic tasks (example item: "I usually do very well in school and at academic tasks"). The Academic Self-Efficacy Scale has demonstrated appropriate reliability and construct validation in previous research (Chemers et al., 2001). In the current study the scale demonstrated adequate internal reliability ($\alpha = 0.93$).

2.2.4. Student covariates

Three student covariate measures were used as statistical controls. Age was computed as a continuous variable using students' date of birth. Gender was measured as a binary variable (0 = *female*, 1 = *male*). Due to the small percentage of students who selected "other" (1.3%) for their gender, this response was treated as missing data. For SES, students reported their parents' occupations using five categories, which were then converted into a 5-point Likert-like scale. Occupation-based scales have previously been used to represent SES in Australia (McMillan et al., 2009). The highest category across both parents for each student was used as students' SES value. The categories were: 1 = *Have not been in paid work in the last* 12 months (6.3% of the sample); 2 = *Machine operators, hospitality staff, assistants, labourers, or related workers* (29.1%); 3 = *Tradespeople, clerks and skilled office, sales, or service staff* (26.5%); 4 = *Other business managers, arts/media/sportspersons or associate professionals* (15.9%); 5 = *Senior management in large business organisation,*

government administration and defence, or qualified professionals (13.7%).

2.3. Statistical analyses

Analyses were conducted using M*plus*, Version 8 (Muthén & Muthén, 2017). Robust maximum likelihood (MLR) was used as the estimator for the analyses. Full information maximum likelihood was used to handle missing data. A measurement model with the three substantive latent factors and three covariates was first tested through confirmatory factor analysis (CFA) to check for appropriate model fit of the constructs. Covariates were measured as single-item manifest factors, with item factor loadings fixed to 1 and item residual variances fixed to 0. Model fit was assessed using the following criteria recommended by Keith (2015): root mean square error of approximation (RMSEA) scores ≤0.05 (≤0.08 for adequate fit), Tucker-Lewis index (TLI) scores ≥0.95 (≥0.90 for adequate fit), comparative fit index (CFI) scores ≥0.95 (≥0.90 for adequate fit), and standardized root mean squared residual (SRMR) scores ≤0.06 (≤0.08 for adequate fit).

Following the CFA, a structural equation model (SEM) was tested for all students in the sample. In this model, academic buoyancy and academic self-efficacy were regressed onto PAS, and academic self-efficacy was regressed onto academic buoyancy. All three substantive factors were also regressed onto the three covariate measures (i.e., gender, age, and SES). A secondary analysis was conducted to inspect the indirect associations between PAS and academic self-efficacy via academic buoyancy. Confidence intervals (95%) were inspected with non-parametric bootstrapping for the indirect associations, using 1000 draws with maximum likelihood estimation.

Next, multigroup analyses were conducted to test for differences between the school-stage setting groups (i.e., primary, high, and central schools). The means of the covariate and substantive variables were compared across the school-stage setting groups. Since M*plus* computes latent variable means to be zero, mean-based composite variables were used to compare the means of PAS, academic buoyancy, and academic self-efficacy. *T*-tests were conducted using SPSS (version 26; IBM, 2022) to test for significant differences.

Models with increasing parameter restraints were then evaluated to test the invariance of the measurement model across the groups. This included a *configural* model where factor loadings and intercepts were freely estimated between the groups; a *metric* model, where factor loadings were constrained to be equal between the groups; and a *scalar* model, where factor loadings and intercepts were constrained to be equal between the groups. Minimal changes in model fit (ΔRMSEA ≤0.015; Δ CFI ≤0.01) would indicate measurement invariance across the groups (Chen, 2007; Cheung & Rensvold, 2002). Since the aim of this multigroup analysis was to test for meaningful differences between the school-stage setting groups, scalar invariance was the desired level of invariance (Collie et al., 2020; van de Schoot et al., 2012).

Multigroup SEM was then conducted to test whether there were differences in the associations between the substantive factors for students in primary, high, and central schools. In this multigroup analysis, the scalar invariance measurement model was used, with the same regression paths that were included as the initial SEM. However, regression betas were allowed to vary between the three groups. Indirect associations were again inspected using non-parametric bootstrapping (1000 draws) and 95% confidence intervals.

Two approaches were used to explore differences and similarities between the school-stage setting groups in the multigroup SEM. First, overall model invariance was tested by investigating change in model fit when the beta values between the substantive factors were constrained to be equal between groups. Minimal changes in model fit (ΔRMSEA ≤0.015; Δ CFI ≤0.01) would indicate broad invariance across the groups (Chen, 2007; Cheung & Rensvold, 2002). Next, path-level invariance was tested by conducting Wald difference tests ($p < .05$) on beta values between groups. Each beta value for the substantive factor associations were tested between the groups.

3. Results

3.1. Measurement model

The descriptive statistics are reported in Table 1. All measures demonstrated approximate normal distribution. Next, CFA was conducted to test the measurement model. The model fit indices indicated acceptable model fit: $df = 177$, $\chi^2 = 461.84$ ($p < .001$); RMSEA = 0.04; CFI = 0.97; TLI = 0.96; SRMR = 0.04. The standardized factor loadings can be seen in Table 1. These loadings were high and statistically significant for all factors, indicating that the measurement model provided a sound base for further analyses. The correlations between the latent variables and student covariates can be seen in Table 2. The correlations between the substantive factors had expected relationships, such that perceived autonomy support (PAS), academic buoyancy, and academic self-efficacy had strong and positive inter-correlations.

3.2. Whole sample SEM results

Following the measurement model, a whole sample SEM model was tested for all students in the dataset. The results can be seen in Table 3. The fit indices indicated acceptable model fit: $df = 177$, $\chi^2 = 461.84$ ($p < .001$); RMSEA = 0.04; CFI = 0.97; TLI = 0.96; SRMR = 0.04. The SEM results can be seen in Table 3. The results demonstrated that PAS predicted academic buoyancy ($\beta = 0.50$, $p < .001$) and academic self-efficacy ($\beta = 0.26$, $p < .001$). Academic buoyancy predicted academic self-efficacy ($\beta = 0.50$, $p < .001$). The indirect effects from the bootstrap SEM can be seen in Table 4. PAS had a significant indirect association with academic self-efficacy via academic buoyancy ($\beta = .25$; 95% CI = [0.20 0.31]), with a total association (direct and indirect) of $\beta = 0.52$; 95% CI = [0.45 0.58]).

Some significant associations were found between the student covariates and substantive factors. Older student age predicted lower PAS ($\beta = -0.28$, $p < .001$) and academic buoyancy ($\beta = -0.08$, $p < .05$). Female students reported significantly greater PAS ($\beta = -0.09$, $p < .01$) and academic self-efficacy ($\beta = -0.16$, $p < .001$). Higher SES predicted greater academic self-efficacy ($\beta = 0.07$, $p < .05$). In total, the model explained 28.5% of the variance of academic buoyancy and 51.0% of the variance of academic self-efficacy.

3.3. Multigroup invariance tests

Next, multigroup analyses were conducted. Construct invariance between the school-stage setting groups was tested through comparing the model fit of configural, metric, and scalar models. The model fit indices are shown in Table 5. Model fit remained similar across the three models (Chen, 2007; Cheung & Rensvold, 2002), indicating that the measurement model structure was invariant across the school-stage setting groups.

3.4. Multigroup mean-level differences

The means of the substantive factors and covariates were compared across the school-stage setting groups (see Table 6). Both primary and central school students reported significantly greater PAS than did high school students (primary vs. high: $t(769) = 9.10$, $p < .001$; high vs. central: $t(691) = -7.05$, $p < .001$). There was no significant difference between primary and central school students' PAS (primary vs. central: $t(442) = 1.22$, $p = .23$). Primary school students reported significantly greater academic buoyancy than did central and high school students (primary vs. high: $t(751) = 7.00$, $p < .001$; primary vs. Central: $t(436) = 3.80$, $p < .001$). Central school students' academic buoyancy was greater than that of high school students, but the difference was only borderline significant (high vs. central: $t(669) = -1.95$, $p = .05$). Primary school students reported significantly greater academic self-efficacy than did central and high school students (primary vs. high: $t(733) = 6.08$, $p <$

Table 1
Descriptive statistics and factor loadings for whole sample.

	Min	Max	Missing %	Mean/%	SD	Skewness	Kurtosis	Factor loading	Alpha
Age	9.66	17.98	7.3%	13.38	1.93	0.22	−0.91		
Gender (male)	0	1	3.3%	46.5%	0.50	0.08	−2.00		
SES	1	5	8.6%	3.02	1.17	0.27	−0.88		
Perceived autonomy support									.94
Item 1	1	7	2.7%	4.55	1.71	−0.46	−0.54	.83	
Item 2	1	7	2.7%	4.93	1.59	−0.71	−0.02	.89	
Item 3	1	7	3.4%	4.69	1.69	−0.52	−0.48	.89	
Item 4	1	7	2.5%	5.07	1.55	−0.70	−0.03	.89	
Item 5	1	7	2.9%	5.01	1.64	−0.72	−0.11	.81	
Item 6	1	7	2.9%	4.76	1.69	−0.57	−0.37	.83	
Academic buoyancy									.85
Item 1	1	7	5.0%	4.56	1.62	−0.47	−0.44	.72	
Item 2	1	7	5.4%	4.28	1.88	−0.32	−0.97	.78	
Item 3	1	7	5.2%	4.21	1.79	−0.27	−0.92	.85	
Item 4	1	7	5.4%	4.73	1.79	−0.58	−0.64	.70	
Academic self-efficacy									.91
Item 1	1	6	7.2%	4.39	1.69	−0.34	−0.70	.80	
Item 2	1	6	6.9%	4.91	1.71	−0.61	−0.49	.76	
Item 3	1	6	7.4%	4.49	1.80	−0.33	−0.85	.81	
Item 4	1	6	7.5%	4.60	1.77	−0.46	−0.70	.81	
Item 5	1	6	7.9%	4.89	1.80	−0.59	−0.59	.73	
Item 6	1	6	8.8%	4.81	1.67	−0.57	−0.39	.87	
Item 7	1	6	8.1%	4.32	1.74	−0.36	−0.70	.77	
Item 8	1	6	7.2%	4.99	1.78	−0.70	−0.42	.79	

Note. Factor loadings are standardized coefficients. For gender, 0 = *female*, 1 = *male*. SES = socioeconomic status.

Table 2
Correlations for whole sample.

	1. Perceived autonomy support	2. Academic buoyancy	3. Academic self-efficacy
1. Perceived autonomy support			
2. Academic buoyancy	**.52*****		
3. Academic self-efficacy	**.55*****	**.65*****	
Age	**−.28*****	**−.22*****	**−.19*****
Gender	**−.08***	−.01	**−.19*****
SES	.02	.06	**.10****

Note. SES = socioeconomic status.
*$p < .05$; **$p < .01$; ***$p < .01$.

Table 3
SEM results for whole sample.

	Standardized Beta (β)
Perceived autonomy support	
Age - > Perceived autonomy support	**−.28*****
Gender (male) - > Perceived autonomy support	**−.09****
SES - > Perceived autonomy support	.03
Perceived autonomy support - > Academic buoyancy	**.50*****
Age - > Academic buoyancy	**−.08***
Gender (male) - > Academic buoyancy	.03
SES - > Academic buoyancy	.05
Perceived autonomy support - > Academic self-efficacy	**.26*****
Academic buoyancy - > Academic self-efficacy	**.50*****
Age - > Academic self-efficacy	−.01
Gender (male) - > Academic self-efficacy	**−.16*****
SES - > Academic self-efficacy	**.07***

Note. SES = socioeconomic status. All β values are standardized.
**$p < .05$; **$p < .01$; ***$p < .001$.*

.001; primary vs. central: $t(434) = 3.90$, $p < .001$). There was no significant difference between central and high school students' academic self-efficacy (high vs. central: $t(653) = -1.13$, $p = .26$).

Table 4
Indirect results from bootstrap SEM for whole sample.

	Indirect Beta (β) [95% CI Values]	Total (indirect + direct] Beta (β) [95% CI Values]
Perceived autonomy support - > Academic buoyancy -> Academic self-efficacy	.25 [.20 .31]	.52 [.45 .58]

Note. All β values are standardized. CI = confidence interval.

Table 5
Multigroup CFA and SEM model fit.

	Chi-Square	*df*	RMSEA	CFI	TLI	SRMR
Preliminary CFA Invariance Tests						
Configural	655.36	396	.045	.97	.96	.05
Metric	690.32	426	.044	.97	.96	.06
Scalar	744.19	456	.045	.96	.96	.06
Multigroup SEM	982.04	591	.045	.96	.95	.05
Multigroup SEM with Constrained Betas Values	996.73	597	.046	.96	.95	.06

Note. df = degrees of freedom; RMSEA = root mean-square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; SRMR = standardized root mean square residual.

The means of the covariate factors were also compared across the school-stage setting groups. As expected, student age varied across the groups (primary vs. high: $t(719) = -32.87$, $p < .001$; primary vs. central: $t(416) = -14.11$, $p < .001$; high vs. central: $t(665) = 11.12$, $p < .001$). All three school-stage setting groups were similar in regard to gender proportions (primary vs. high: $t(758) = -0.05$, $p = .96$; primary vs. central: $t(436) = 0.47$, $p = .64$; high vs. central: $t(684) = 0.57$, $p = .57$). Similarly, all three school-stage setting groups were similar regarding SES (primary vs. high: $t(706) = -0.12$, $p = .91$; primary vs. central: $t(421) = -0.73$, $p = .46$; high vs. central: $t(647) = -0.67$, $p = .51$).

Table 6
Comparisons of group means.

	Primary School (1)	High School (2)	Central School (3)
Age	$M = 11.28$, $SD = 0.70$ *(2, 3)*	$M = 14.52$, $SD = 1.43$ *(1, 3)*	$M = 13.05$, $SD = 1.75$ *(1, 2)*
Gender *(female = 0; male = 1)*	$M = 0.48$, $SD = 0.50$	$M = 0.49$, $SD = 0.50$	$M = 0.46$, $SD = 0.50$
SES	$M = 3.00$, $SD = 1.06$	$M = 3.01$, $SD = 1.21$	$M = 3.08$, $SD = 1.21$
Perceived autonomy support	$M = 5.39$, $SD = 1.42$ *(2)*	$M = 4.40$, $SD = 1.42$ *(1, 3)*	$M = 5.23$, $SD = 1.19$ *(2)*
Academic buoyancy	$M = 4.95$, $SD = 1.39$ *(2, 3)*	$M = 4.18$, $SD = 1.45$ *(1, 3^)*	$M = 4.43$, $SD = 1.44$ *(1, 2^)*
Academic self-efficacy	$M = 5.12$, $SD = 1.42$ *(2, 3)*	$M = 4.45$, $SD = 1.42$ *(1)*	$M = 4.59$, $SD = 1.35$ *(1)*

Note. Numbers in brackets identify groups that have significantly different means ($p < .05$). M = mean; SD = standard deviation; ^ = borderline significance ($p = .05$); SES = socioeconomic status.

3.5. Multigroup SEM results

The multigroup SEM fit indices indicated appropriate fit (see Table 5). Model fit remained similar when the substantive factor beta values were constrained to be equal across the groups, indicating broad model-level invariance (see Table 5). The multigroup SEM results for the unconstrained beta model can be seen in Fig. 1 and Table 7.

Next, path-level similarities and differences in the substantive factors between the school-stage setting groups are reported. PAS predicted greater academic buoyancy for all three groups (primary: $\beta = .66$, $p < .001$; high: $\beta = 0.42$, $p < .001$; central: $\beta = 0.44$, $p < .001$). Wald difference tests found the betas were significantly different between the primary and high school groups (Wald = 4.33, $p < .05$), but were not significantly different between the primary and central school groups (Wald = 0.50, $p = .48$), nor between the high and central school groups (Wald = 0.70, $p = .40$).

PAS predicted greater academic self-efficacy for the high school ($\beta = 0.29$, $p < .001$) and central school ($\beta = 0.30$, $p < .001$) groups; however, this association was not significant for the primary school group ($\beta = 0.10$, $p = .28$). Wald difference tests did not find significant differences in the beta values between the primary and high school groups (Wald = 2.57, $p = .11$), nor between the primary and central school groups (Wald = 2.86, $p = .09$), nor between the high and central school groups (Wald = 0.20, $p = .65$).

Academic buoyancy predicted greater academic self-efficacy for all groups (primary: $\beta = 0.70$, $p < .001$; high: $\beta = 0.44$, $p < .001$; central: $\beta = 0.48$, $p < .001$). Wald differences tests found the betas were significantly different between the primary and high school groups (Wald = 7.44, $p < .01$), and between the primary and central school groups (Wald = 4.89, $p < .05$), but were not significantly different between the high and central school groups (Wald = 0.10, $p = .75$).

Turning to the covariate associations, age predicted lower PAS for the central school group ($\beta = -0.40$, $p < .001$), but this association was not significant for the primary and high school groups. Gender (male) predicted lower PAS for the primary school group ($\beta = -0.22$, $p < .001$), but this association was not significant for the central and high school groups. Gender (male) predicted lower predicted academic self-efficacy for all three school-stage setting groups (primary: $\beta = -0.19$, $p < .001$; high: $\beta = -0.14$, $p < .001$; central: $\beta = -0.18$, $p < .01$). SES predicted greater academic self-efficacy for the central school group ($\beta = 0.17$, $p < .01$), but this association was not significant for the primary and high school groups.

PAS had a significant indirect association with academic self-efficacy via academic buoyancy for all three school-stage setting groups (see Table 8): primary school group (indirect association: $\beta = 0.46$, 95% CI = [0.30 0.63]; total association [direct and indirect]: $\beta = 0.56$, 95% CI = [0.44 0.69]); high school group (indirect association: $\beta = 0.18$, 95% CI = [0.12 0.25]; total association: $\beta = 0.47$, 95% CI = [0.38 0.56]); central school group (indirect association: $\beta = 0.21$, 95% CI = [0.10 0.33]; total association: $\beta = 0.51$, 95% CI = [0.38 0.64]).

Overall, the model explained the most variance for the primary school group, explaining 47.7% of the variance of academic buoyancy and 69.7% of the variance of academic self-efficacy. For the high school group, the model explained 18.4% of the variance of academic buoyancy and 39.4% of the variance of academic self-efficacy. For the central school group, the model explained 25.2% of the variance of academic buoyancy and 54.5% of the variance of academic self-efficacy.

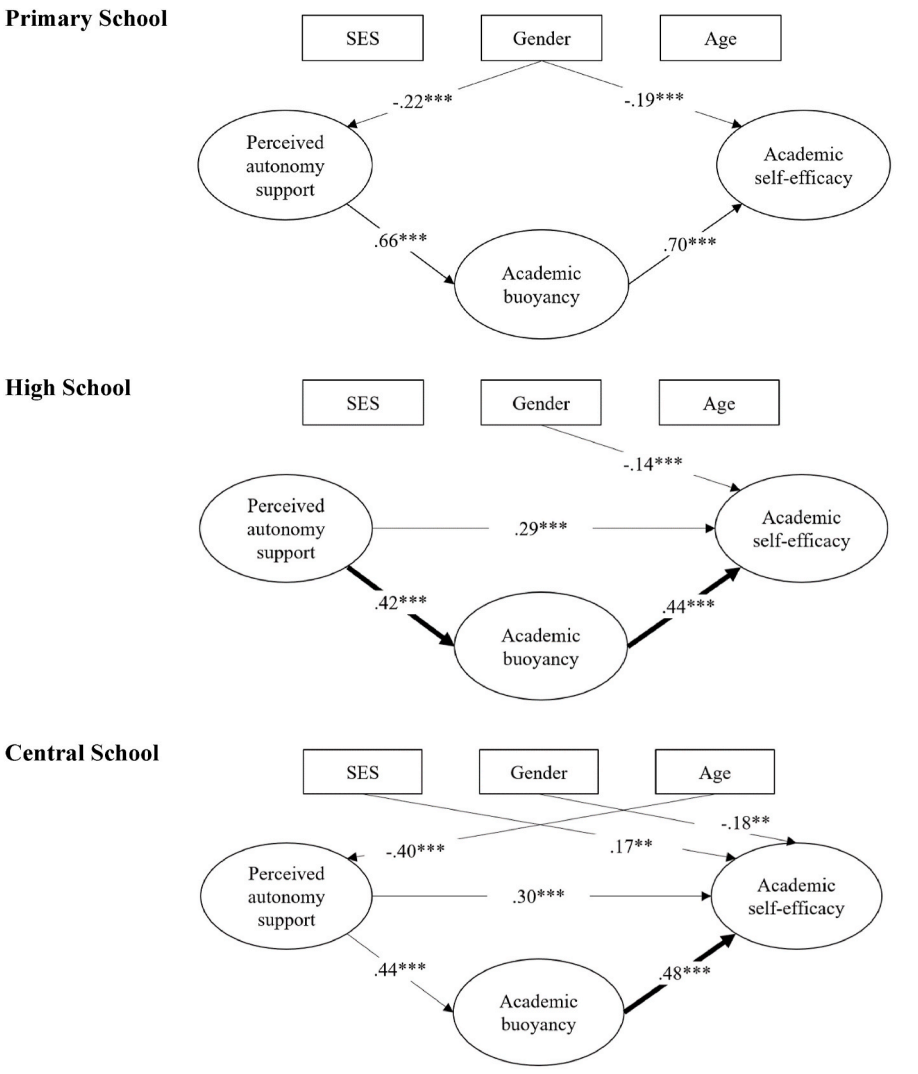
4. Discussion

This study investigated the associations between perceived autonomy support (PAS), academic buoyancy, and academic self-efficacy for students in rural schools in Australia. The results revealed that students' PAS was a significant predictor of their academic buoyancy and academic self-efficacy. Further, academic buoyancy was found to partially mediate the association between PAS and academic self-efficacy in high and central school contexts, and to fully mediate this association in primary school contexts. These results provide support for autonomy support as an effective motivating style across different school-stage settings in rural areas for nurturing students' ability to handle challenges and feel efficacious in their school studies.

This study offers several important contributions to the literature. First, rural education has received much less academic attention than metropolitan school settings (Roberts & Fuqua, 2021; Stockard, 2011). The current results are consistent with other rural-focused studies in showing that PAS was associated with adaptive student self-beliefs in rural schools (Hardre & Reeve, 2003; Zhou et al., 2009). Together, the findings suggest that autonomy support may help to address educational outcome gaps in rural schools (Echazarra & Radinger, 2019; OECD, 2018). Second, the finding that PAS predicted greater academic buoyancy is a novel contribution of this study. This finding is consistent with previous research that has shown positive associations between teacher support and academic buoyancy (Granziera et al., 2022; Tarbetsky et al., 2017). This suggests that autonomy support may help students to better handle the day-to-day challenges of school life. Third, the current study's multigroup model demonstrated important similarities and differences in the levels of and associations between the substantive factors in primary, high, and central school settings. Scant research has investigated such differences in rural contexts. The current results suggest that primary school students may have the most adaptive school experiences. These findings are discussed below.

4.1. School-stage setting similarities

The current study identified several similarities across the three school-stage settings in the associations between PAS, academic buoyancy, and academic self-efficacy. First, PAS predicted greater academic buoyancy in all three school-stage settings. This is a novel finding in the current study. From this, it appears that supporting students' internal motivational resources is associated with students better coping with academic setbacks. This may be because students who receive autonomy supportive teaching may value and enjoy their schooling (Reeve, 2016) and thus may see academic setbacks as part of this valued learning process (Dweck & Master, 2007). Academic buoyancy is a relatively new construct in the literature, yet it has been linked to several important educational outcomes including school engagement (af Ursin et al., 2021), valuing and enjoyment of school (Martin et al., 2017), and future study intentions (Martin et al., 2013). It is thus beneficial to better understand how academic buoyancy can be supported in educational settings. Although the current results are only cross-sectional, previous longitudinal research has demonstrated that students' prior levels of autonomy satisfaction in learning contexts are predictive of future



Note. All paths show the standardized beta values. Only significant ($p < .05$) paths are shown. SES = socioeconomic status. For gender, 0 = *female*, 1 = *male*. Bold paths are significantly different from the primary school group ($p < .05$). *$p < .05$; **$p < .01$; ***$p < .001$

Fig. 1. Multigroup SEM Results
Note. All paths show the standardized beta values. Only significant ($p < .05$) paths are shown. SES = socioeconomic status. For gender, 0 = *female*, 1 = *male*. Bold paths are significantly different from the primary school group ($p < .05$). *$p < .05$; **$p < .01$; ***$p < .001$.

academic buoyancy (Aydın & Michou, 2020). Future studies may wish to explore this area further through examining whether autonomy support interventions in schools (Reeve et al., 2019) help to increase academic buoyancy over time in rural schools.

Academic buoyancy also predicted greater academic self-efficacy in all three school-stage settings. This is consistent with previous findings that academic buoyancy was associated with academic self-concept in primary school settings (Colmar et al., 2019) and self-efficacy in high school settings (Martin et al., 2010). From this, it appears that students with lower academic buoyancy also feel less efficacious. For these students, a setback such as a lower test result may damage their sense of self-efficacy and begin a downward spiral of low levels of buoyancy and self-efficacy (Martin et al., 2010). Although this association has previous evidence (Martin et al., 2017), the current study provides empirical support for this association in primary, high, and central schools in rural settings. Future studies may wish to further explore the potential reciprocal relations between academic buoyancy and academic self-efficacy across different school-stage settings through longitudinal research design (Bostwick et al., 2022; Martin et al., 2010).

PAS was found to have positive indirect associations with academic self-efficacy via academic buoyancy in all three school-stage settings. Although the direct associations between PAS and academic self-efficacy differed across the school-stage settings (as is discussed later), the indirect associations indicated that higher levels of PAS were linked to higher levels of academic self-efficacy, which is consisted with previous research (Gutiérrez & Tomás, 2019; Hardre & Reeve, 2003; Zhao & Qin, 2021; Zhou et al., 2009). This could be because autonomy supportive teaching fosters student engagement (Cheon et al., 2016) and supports academic achievement (Jang et al., 2012), allowing students to feel buoyant and successful in the classroom. Autonomy support may also help students to focus on their own successes, instead of on peer comparisons (Burns et al., 2017). Thus, the results suggest that autonomy support may be an effective pedagogical approach to support both academic buoyancy and academic self-efficacy in rural schools across

Table 7
Multigroup SEM results.

	Primary School	High School	Central School
Perceived autonomy support			
Age - > Perceived autonomy support	.04	.02	**−.40*****
Gender (male) - > Perceived autonomy support	**−.22*****	−.03	−.08
SES - > Perceived autonomy support	.04	.00	.05
Perceived autonomy support - > Academic buoyancy	**.66*****	**.42*****	**.44*****
Age - > Academic buoyancy	.04	−.06	−.10
Gender (male) - > Academic buoyancy	−.06	.08	.08
SES - > Academic buoyancy	.09	.01	.08
Perceived autonomy support - > Academic self-efficacy	.10	**.29*****	**.30*****
Academic buoyancy - > Academic self-efficacy	**.70*****	**.44*****	**.48*****
Age - > Academic self-efficacy	−.03	.04	−.02
Gender (male) - > Academic self-efficacy	**−.19*****	**−.14*****	**−.18****
SES - > Academic self-efficacy	.04	.05	**.17****

Note. SES = socioeconomic status. All β values are standardized.
**p < .05; **p < .01; ***p < .001.*

Table 8
Indirect results from bootstrap multigroup SEM.

	Indirect Beta (β) [95% CI Values]	Total (indirect + direct] Beta (β) [95% CI Values]
Primary school students		
Perceived autonomy support - > Academic buoyancy -> Academic self-efficacy	.46 [.30 .63]	.56 [.44 .69]
High school students		
Perceived autonomy support - > Academic buoyancy -> Academic self-efficacy	.18 [.12 .25]	.47 [.38 .56]
Central school students		
Perceived autonomy support - > Academic buoyancy -> Academic self-efficacy	.21 [.10 .33]	.51 [.38 .64]

Note. All β values are standardized. CI = confidence interval.

different school-stage settings.

Female students reported greater academic self-efficacy than male students across all three school-stage settings. This finding is consistent with the general trend of male students being less engaged and achieving lower academic outcomes (CESE, 2017; Lietaert et al., 2015). Male students in rural schools have also been found to hold lower educational aspirations than their female peers (CESE, 2015). The current results indicate that teachers may need to be particularly aware of supporting the academic self-efficacy of their male students in rural contexts. Next, differences between the school-stage settings are discussed.

4.2. Differences between the school-stage settings

Several differences were identified in the factor associations across the three school-stage settings. First, primary school students reported the most adaptive responses to their school experiences. These students reported greater PAS than did the high school group, and greater academic buoyancy and academic self-efficacy than did both the high and central school groups. Considering that PAS was found to predict greater academic buoyancy and academic self-efficacy, it seems likely that PAS may be implicated in the differences in academic buoyancy and academic self-efficacy between the primary and high school groups. This finding is consistent with previous research that identified younger students perceive receiving greater autonomy support than older students (Gillet et al., 2012). Primary school students also spend more time with one teacher over a school year, which may help stronger student-teacher relationships develop (Roorda et al., 2011) and thus may support academic buoyancy (Tarbetsky et al., 2017) and academic self-efficacy (Hughes & Chen, 2011).

On the other hand, high school students' lower levels of PAS may be connected to their learning environments. Researchers have suggested that high school students can desire greater autonomy than current school systems provide (Mahatmya et al., 2012), which may limit their perceptions of autonomy support. High school students' lower levels of academic buoyancy and academic self-efficacy may also be linked to other factors, such as increasing academic pressures in high school and peer comparisons (Berry & West, 1993; Granziera et al., 2022; Smith & Sinclair, 2000). Such extrinsic drives may limit the relevance that students see in their education, especially if tertiary education or high examination marks are not valued by the student. This is particularly important in rural schools where examples drawn from students' experiences are often seen as an important engagement hook (Roberts, 2013). Indeed, the growth of place-based education in rural schools reflects the increasing recognition of needing to engage students using their own social and cultural experiences (Corbett, 2020). Thus, the current findings suggest that high school students in rural schools may benefit from greater autonomy support at school to help them find relevance in their learning, and to build greater academic buoyancy and academic self-efficacy.

The substantive factor scores for the central school group sat in between the primary and high school groups. However, the differences between groups were not consistently significant. There was no significant difference in PAS between primary and central school students. This may be due to the small student and teacher numbers in central schools, which may allow closer student-teacher relationships to develop (Crosnoe et al., 2004) and thus may aid greater autonomy support. However, younger students in central schools did report higher levels of PAS than did older students, which suggests there may still be primary and high school-level differences within central schools. The academic self-efficacy of the central school group was not significantly different from the high school group. Central school settings can vary quite considerably from each other because of school size, teachers available, and proportion of students in primary and high school years (What Works National Office National Curriculum Services, 2012). This makes it difficult to disentangle why self-efficacy was lower in central schools in comparison to primary schools. Further, SES predicted academic self-efficacy in central schools, but not in the other two groups, which demonstrates further complexities in the nature of academic self-efficacy in central schools. More research is needed to better understand the unique attributes of central schools and how such contexts are associated with students' PAS, academic buoyancy, and academic self-efficacy.

The current study also identified significant differences in the strength of associations between PAS, academic buoyancy, and self-efficacy across the school-stage settings. Most notably, in the primary school group academic buoyancy completely mediated the association between PAS and academic self-efficacy, whereas this was only a partial mediation in the high and central school groups. Further, academic buoyancy had a significantly stronger association with academic self-efficacy for the primary school group than the other two groups. These findings suggest that academic buoyancy may be particularly important in primary school settings in rural contexts. This may be because primary school students' academic self-beliefs are likely more malleable than high school students (Martinek & Kipman, 2016). The results suggest that primary school students' academic buoyancy and academic self-efficacy are strongly linked. Future research may wish to further investigate this area through longitudinal research design to better understand how academic buoyancy functions across different school-stage settings over time.

The association between PAS and academic buoyancy was also stronger in the primary school group than the high school group. This

indicates that PAS may be more closely linked to academic buoyancy in primary schools than in high schools. Since primary school students spend more time with one teacher over a school year, the autonomy support they receive from their teacher may be more closely linked to their daily academic resilience.

The current results indicate that autonomy support may be particularly salient in primary school settings in rural schools. The results also indicate that high and central school students may benefit from autonomy support to nurture academic buoyancy and academic self-efficacy. Older students often report lower PAS, especially in middle high school years (Gillet et al., 2012) as their teachers may put more emphasis on disciplinary action and classroom control (Bergin & Bergin, 2009). This is counter to the developmental needs of adolescents for greater autonomy (Mahatmya et al., 2012). Indeed, disengaged students can often receive the most controlling teacher behaviors (Sarrazin et al., 2006), despite the benefits that autonomy support can provide to students (Reeve, 2009). Greater autonomy support in high and central school settings may help students to feel more buoyant and efficacious. Hence, autonomy support may be beneficial in all school-stage settings in rural contexts.

4.3. Implications for rural schools

The current results support the importance of autonomy support in rural schools. This has implications for the pedagogies used in these schools. Some reports have indicated that teachers in more remote areas in Australia may on average have less experience than their provincial and metropolitan colleagues (McKenzie et al., 2014). Further, teachers in rural areas may experience barriers to access professional development due to long distances from urban centers and other schools, as well as shortages in casual staff to relieve teaching duties (Jenkins et al., 2015). These factors may impact teachers' ability and confidence to use autonomy supportive practices. Schools in rural areas may benefit from prioritizing professional learning that focuses on autonomy supportive teaching to increase teachers' exposure to this motivating style (Reeve et al., 2019). Studies have also shown that teachers are more likely to adopt more autonomy-supportive approaches and feel more efficacious when their own autonomy and basic psychological needs are supported at school (Moè et al., 2022; Orakci & Durnali, 2023; Pelletier et al., 2002). Pre-service teachers may also benefit from greater training on autonomy support and also from experiencing autonomy support in their teacher education (Chan et al., 2021; Khotimah et al., 2023).

The current results also have implications for national curriculums. Greater autonomy support may be realized through encouraging teachers to develop confidence in linking their curriculum enactment with local examples, and not being constrained by available texts that are not from a rural perspective (Roberts, 2013). However, it is also important that national curriculum topics are designed to be relevant to rural students. Teachers in rural areas in Australia have reported needing to adapt national curriculum topics to be relevant to their students (Lock et al., 2012; Papatraianou et al., 2018). Some researchers have argued that the Australian national curriculum prioritizes metropolitan experiences and ways of being, while local community needs in rural locations are not adequately addressed (Roberts, 2014). Indeed, some national standardized tests may afford cultural capital advantages to students in metropolitan schools (Frawley & McLean Davies, 2015). If the curriculum is perceived to be irrelevant by students in rural areas, then teachers can be caught in a bind between student disengagement linked to perceived irrelevance and the impulse of the teacher to assert control over the classroom. Ensuring that school learning is relevant to all students, no matter where they live, may help students develop greater agency in their education and help reduce gaps in academic and school outcomes (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2019).

4.4. Limitations

Although the findings of this study have significant implications, it is important to note some limitations of the study. First, this study used cross-sectional data and thus causality between constructs cannot be claimed. There are, however, some longitudinal studies that provide preliminary evidence for similar factor associations occurring between different timepoints (Aydın & Michou, 2020; Martin et al., 2010). Future studies may wish to use longitudinal analyses to build upon the current findings. Second, the schools involved in this study were chosen using convenience sampling. School-level convenience sampling was deemed appropriate as schools can be representative of wider student populations (Gravetter & Forzano, 2012). Despite this, more sophisticated forms of sampling may be used in future studies, such as random sampling to select schools, as used in OECD studies like the Programme for International Student Assessment (PISA). Third, the current study used self-report measures from students. Although academic buoyancy and academic self-efficacy are arguably best measured using students' self-reports because they are internal unobservable factors, future studies may wish to measure autonomy support through multiple datasets (e.g., external observations, teacher reports). Fourth, we examined student gender as a covariate, however, future research may wish to examine whether the factor associations differ for male and female students because of potential differences in school experience (Lietaert et al., 2015). Finally, although we were unable to test the influence of students' sense of belonging in school and in the curriculum, and the value of education in general, the results in the context of the broader research project (Beswick et al., 2023) from which they were drawn suggest this may well be an important avenue for further examination.

5. Conclusion

The current study examined the associations between students' perceived autonomy support (PAS), academic buoyancy, and academic self-efficacy in rural schools in Australia. The results demonstrated that PAS is predictive of students' academic buoyancy and academic self-efficacy. The results also demonstrated primary school students on average report more adaptive school experiences than high and central school students. In these younger-year school settings, PAS was found to principally predict students' academic buoyancy, which in turn predicted academic self-efficacy. However, PAS was also found to be important in high and central school contexts. High school students reported experiencing less of this type of support, which may lead to lower levels of academic buoyancy and academic self-efficacy. Older students in central schools also reported lower levels of PAS. As school systems around the world struggle to reduce the gap between the educational outcomes of rural and metropolitan schools, the current results illustrate that autonomy support may help students in rural schools to feel more resilient and efficacious.

CRediT authorship contribution statement

Andrew A. Kingsford-Smith: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Dennis Alonzo:** Writing – original draft, Supervision, Methodology, Formal analysis, Conceptualization. **Kim Beswick:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition. **Tony Loughland:** Writing – review & editing, Supervision, Investigation. **Philip Roberts:** Writing – review & editing, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors have no conflict of interest to declare.

Data availability

The data that has been used is confidential.

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