Predicting student engagement from self-efficacy and autonomous motivation: A cross-sectional study

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Abstract: This prospective study was designed to investigate the relationship between self-efficacy, autonomous motivation and engagement within a higher education setup. A convenient sample of 512 students participated in the study through the completion of self-reported questionnaires. Data were analysed using descriptive statistics and PLS-SEM. Results from the analysis showed self-efficacy and autonomous motivation enhances peer and intellectual engagement. Additionally, autonomous motivation positively mediates the effect of self-efficacy on both peer and intellectual engagement. The findings of the study provide important implication for management of higher education students. Management of higher education institutions must develop effective and efficient policies that assist students to develop and manage their self-efficacy.

Subjects: Multidisciplinary Psychology; Behavioral Psychology; Educational Psychology

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PUBLIC INTEREST STATEMENT
This examine mediating model of student engagement among university students. The outcome of the study reveals the combine effect of self-efficacy and autonomous motivation positively influence two dimensions of student engagement, thus intellectual and peer engagement. The findings of the study provide important implication for management of higher education students. Management of higher education institutions must develop effective and efficient policies that assist students to develop and manage their self-efficacy.
Keywords: Self-efficacy; autonomous motivation; intellectual engagement; peer engagement; university

1. Introduction
This study adopted the conservation of resource theory (COR) (Hobfoll, 2002) to examine the mediating effect of autonomous (intrinsic) motivation on direct relation between self-efficacy and engagement among university students. COR theory suggests that individuals are driven to create, foster, nurture and conserve valued resources to meet definite goal (Hobfoll et al., 2018; Hobfoll, 2002). The theory suggests that resources including personality characteristics (self-esteem, self-efficacy, energies, etc.) are valuable and should be protected. COR theory has been generally used in stress management and burnout studies (Hobfoll and Shirom, 2001). Nonetheless, its basic tenets are supported by other studies where psychological distress and resource loss and applications are evident (Hobfoll et al., 2006). In line with COR theory, this study contends that self-efficacy provides resources which is crucial in higher education environment. Given that engagement is a stressful process for most students, they need resources to cope and develop positive attitude. Students endowed with self-efficacy as a resource are better able to handle academic challenges and are empowered to flourish and succeed with their academic goals (Sweetman & Luthans, 2010).

This study was motivated by two main reasons. First, studies on student engagement have blossom globally, since scholars have enumerated its implications in higher educational context including delivery of high-quality learning experience (Kuh, 2009), student retention and perseverance (Khodemi Ashkzari et al., 2018), enhancement of institutional reputation (Kuh et al., 2006), acquisition of employability skills (Towl & Senior, 2010) among others. Although studies have recognised and studied different types of student engagement (Cloete et al., 2015), surprisingly, little attention has been paid to intellectual engagement (IE) and peer engagement (PE) proposed by Krause and Coates (2008). Additionally, studies examining student’s engagement in the higher education environment from Sub-Saharan perspective is under-researched (Ansong et al., 2017; Azila-Gbettor et al., 2020), creating a gap in the contemporary literature.

Second, in previous studies, self-efficacy (Singh & Abdullah, 2020; Zhen et al., 2017) and autonomous motivation (Akpan & Umobong, 2013; Froiland & Worrell, 2016) have been found to be potential predictors of student engagement. Despite the importance of self-efficacy and autonomous motivation, there remains a paucity of evidence on how self-efficacy and autonomous motivation contributes to peer and intellectual engagement, among tertiary students from sub-Saharan Africa. Furthermore, the mediating effect of autonomous motivation on the direct relationship between self-efficacy and student engagement, and thus intellectual and peer engagement, particularly in the context of higher education is understudied. Undoubtedly, studies on interaction between self-efficacy and autonomous on engagement are derisory from the perspective of Sub-Saharan Africa. In this study, we address this gap by examining whether the relationship between self-efficacy and student engagement is mediated by autonomous motivation.

This study contributes to the literature on self-efficacy, autonomous motivation and engagement in the following ways: First, we extend research on student engagement literature by focusing on intellectual and peer engagement there by providing a more comprehensive picture of the relationships. Second, we expand on previous studies by investigating the mediating effects of autonomous motivation on self-efficacy and engagement nexus. Finally, the study enriches existing literature on self-efficacy and student outcome by examining the model within an unrepresented context.

2. Literature review and hypotheses development

2.1. Self-efficacy
Self-efficacy defines “people’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performances” (Bandura, 1986, p. 391). In the
context of education, self-efficacy relates to beliefs and judgments around individual students' efficacy and ability to fulfill certain academic responsibilities and duties (Fife et al., 2011). Several studies contend that self-efficacy is important for students to continually perform difficult tasks in their academic environment (Achenreiner et al., 2019; Putri & Prabawanto, 2019). Self-efficacy has been shown to reliably correlate positively with academic outcomes and effective coping mechanisms (Paciello et al., 2016). Students with higher academic self-efficacy have been found to effectively manage tough academic duties and their school life better (Allari et al., 2020; Doménech-Betoret et al., 2017; Vogel & Human-Vogel, 2016). Studies have also shown that students with low academic self-efficacy are more vulnerable and less willing to perform academic duties (Bassi et al., 2007).

2.2. Student engagement

S. Hu and Kuh (2001, p. 3) define student engagement as “the quality of effort students devote to educationally purposeful activities that contribute directly to desired outcomes”. In the educational literature, student engagement remains a mixed bag and is considered a multifaceted construct (Kim et al., 2015). Most definitions of student engagement cover emotional, behavioural and cognitive engagements (Coates, 2006; Fredricks et al., 2004) and “agentic engagement” (Reeve & Tseng, 2011). This study focused on intellectual and peer engagement. Intellectual engagement explains students “emotional and cognitive investment in learning”, using higher-order thinking skills to increase understanding, construct new knowledge and solve complex problems (Willms et al., 2009). Peer engagement provides insights into students’ judgements regarding attitudes and values pertaining to their experiences within the broader learning community (Krause & Coates, 2008). Engaged students have been found to demonstrate excellent academic motivation and functioning (Frayser et al., 2020; Tuominen-Soini & Salmela-Aro, 2014) and positive attributes including high levels of energy and enthusiastic involvement in studies (Bakker et al., 2015).

2.3. Autonomous motivation

Academic motivation denotes the cause of behaviours that are linked with academic functioning and success (Mallick et al., 2017). It represents student’s longing and is reflected in students’ level of interest, approach, perseverance regarding their studies (Wigfield & Eccles, 2002). Deci and Ryan (2002) theorized three categories of student academic motivational orientations based on self-determination theory or a continuum including amotivation, extrinsic motivation and intrinsic motivation. These three types of motivation demonstrate diverse ways in which an individual adjusts his or her driving forces (Utvaer & Haugan, 2016). At the top of the continuum is intrinsic motivation also called autonomous motivation, that denotes the most self-determined form of behaviour regulation and is explained as “doing an activity for its inherent satisfactions rather than for some separable consequence” (Deci & Ryan, 2000, p. 3). Stated differently, autonomous motivation concerns doing “an activity for itself, and the pleasure and satisfaction derived from participation” in and accomplishment of certain tasks (Deci & Ryan, 2000, p. 56). Autonomous motivation provides the fuel for various behaviours and psychological processes (Cetin, 2015). Individuals with high autonomous motivation exhibit high intellectuality, inherent locus of control, participate in activities and relish achievement of a task for its pleasure and are eager to learn new things (Komarraj et al., 2009). Autonomous motivation has been found to be associated with engagement (De Naeghel et al., 2012).

2.4. Self-efficacy, student engagement and autonomous motivation

The nexus between self-efficacy and engagement is elucidated by expectancy-value theory (Vroom, 1964). According to this theory, people’s behavioural and emotional engagement is moulded by their level of self-efficacy (Olivier et al., 2019). Studies on self-efficacy and engagement, thus intellectual and peer engagement are rare. However, there is a proliferation of empirical studies on self-efficacy and other student engagement concepts (Singh & Abdullah, 2020; Zhen et al., 2017). For example, Zhen et al. (2017) examined 605 students in the city of Handan, Hebei province in China and confirm a positive association between academic self-efficacy and learning
engagement. Singh and Abdullah (2020) reported positive and significant associations between self-efficacy and student engagement among 400 students selected from Jammu and Kashmir.

Students’ belief about their capabilities from psychological resources such as self-efficacy has been found to play a critical role in the self-regulation of motivation (Bandura, 1996). Self-efficacy beliefs contribute to motivation through several means including determination of goals, efforts expended, perseverance and resilience by individuals (Bandura, 1994). Evidence shows that efficacy beliefs contribute significantly to the level of motivation (Close & Solberg, 2008; Wang et al., 2008) and extraordinary performance (Carver & Scheier, 2014). Based on this review, we therefore infer the following hypotheses:

$H_1$: Self-efficacy positively predicts intellectual engagement.

$H_2$: Self-efficacy positively predicts peer engagement.

$H_3$: Self-efficacy positively predicts autonomous motivation.

2.5. Autonomous motivation and student engagement

Student engagement has long been considered as an outcome of a motivational process (Skinner et al., 2009). Results of several studies have demonstrated that, intrinsically motivated students have lower levels of anxiety, higher levels of achievement, and higher perceptions of competence and engage in learning than students who are not intrinsically motivated (Wigfield & Eccles, 2002; Wigfield & Waquar, 2005). Foiland and Worrell (2016) found autonomous motivation to learn, to affect behavioural engagement of 1,575 students in an ethnically and racially diverse high school in San Francisco Bay Area. Akpan and Umobong (2013) studied 540 second circle students from Nigeria and found that achievement motivation had a significant impact on academic engagement with highly motivated students being more academically engaged than the moderately and lowly motivated students. Therefore, we infer the following hypotheses:

$H_4$: Autonomous motivation positively predicts intellectual engagement.

$H_5$: Autonomous motivation positively predicts peer engagement.

2.6. Mediating role of autonomous motivation

Bryan and Glynn (2011) contends that intrinsically motivated students participate in an activity for enjoyment, the learning it permits, and/or the sense of accomplishment it brings. Relative to self-efficacy, evidence adduced in the earlier review suggest efficacy beliefs contribute meaningfully to level of motivation (Close & Solberg, 2008; Wang et al., 2008) and engagement (Singh & Abdullah, 2020; Zhen et al., 2017). Consequently, we infer that autonomous motivation may be the exact mechanism through which self-efficacy may influence both intellectual and peer engagement. The hypothesized mediating role of autonomous motivation on self-efficacy and student engagement nexus hinges on the belief that, students who perceive themselves to have personal resources would demonstrate abundance of autonomous motivation and become highly engaged in all activities. On the premise of the foregoing, the following hypotheses were stated:

$H_6$: Autonomous motivation mediates the relationship between self-efficacy and intellectual engagement.

$H_7$: Autonomous motivation mediates the relationship between self-efficacy and peer engagement.
3. Methodology

3.1. Sample and procedure
A cross-sectional research design was adopted to examine the proposed hypotheses. The study participants were selected using a convenient sampling technique. Data were collected through self-reported questionnaire from 512 full-time students from two tertiary institutions in Ghana between March and April 2019. Data collection was undertaken in the classrooms after permission was sought from Heads of Department and the questionnaire took on the average, 25.7 minutes to complete. The participants were informed about their right to consent to participate in the study as well as assuring them of anonymity and confidentiality of information they may provide. Gender representation of respondents was almost split between male (54.4%) and female (45.6%). Exactly 98.8% of the students were single and 65.4% were aged between 21 and 25 years, and 48.9% studied business-related courses. Respondents marital and age distributions characteristically reflects the profile of university students in other studies in Ghana (Azila-Gbettor et al., 2020; Mensah & Azila-Gbettor, 2018; Mensah et al., 2020) and reveal youthful nature of university students.

3.2. Measures
Data for the study were collected using validated questionnaires in the current literature. Table 1 shows the summary of the sources, number of items, validity and reliability of the original scales and scale range of the latent constructs studied. Sample items of concepts include (i) self-efficacy—“I feel confident analysing a study-related long-term problem to find a solution”, (ii) intellectual engagement—“I enjoy the intellectual challenge of subjects I am studying”, (iii) peer engagement—“I regularly work with other students on course areas with which I have problems” and (iv) autonomous motivation—“Because I experience pleasure and satisfaction while learning new things”.

3.3. Analytical approach
Descriptive statistics in conjunction with partial least squares-based structural equation modelling (PLS-SEM) (Hair et al., 2017) was used to analyse respondents’ demographic features and test the research model and related hypotheses, respectively. The choice of PLS-SEM was appropriate because it is mostly applied in multivariate analysis (Hair et al., 2012). Based on Hair et al. (2017) guidelines, measurement models were assessed first followed by structural model. PLS algorithm followed by bootstrapping sampling (5000 re-sample) was applied at testing for a two-

| Table 1. Sources of Measures of Concepts |
|------------------------------------------|
| Latent Construct | No. of Items | Source | Original Cronbach Value | Range of Scale |
|------------------|--------------|--------|-------------------------|----------------|
| Self-efficacy    | 6            | F. Luthans et al. (2007). (self-efficacy dimension of psychological scale) | 0.87 | 5-point LS; 1 = strongly disagree 5 = strongly agree. |
| Autonomous motivation | 12 | Vallerand et al. (1993) (Intrinsic dimension of academic motivation scale) | 0.70 | 7-point LS; 1 = does not correspond at all to 7 = corresponds exactly. |
| Intellectual engagement | 5 | Krause and Coates (2008) | 0.80 | 5-point LS; 1 = strongly disagree to 5 = strongly agree. |
| Peer engagement  | 9            | Krause and Coates (2008) | 0.72 | 5-point LS; 1 = strongly disagree to 5 = strongly agree. |
tailed significance of 95% (Anderson & Gerbing, 1988) to determine factor loadings, path coefficients and their respective significance levels.

3.4. Measurement model assessment
The measurement model quality was assessed by evaluating the reliability and validity coefficients of latent constructs. The test of reliability and validity was conducted and confirmed by iteratively observing the factor loadings and items of latent constructs that did not meet the threshold of 0.7 were removed. For example, two indicators of autonomous motivation were deleted, which consequently improved the construct’s reliability and validity. All items of self-efficacy, intellectual and peer engagement were retained. As shown in Table 2, all the measures of the latent constructs were robust in terms of their reliability as the composite reliability (CR) coefficients ranged from 0.868 to 0.937, exceeding the recommended threshold value of 0.70 (Bagozzi & Yi, 1988). Furthermore, all the Cronbach alpha (CA) coefficients range from 0.901 to 0.947, exceeding the suggested threshold of 0.7 (Nunnally, 1978). Furthermore, the average variance explained (AVE) for all variables was higher than 0.50, ranging from 0.603 to 0.709, thus confirming the reliability and convergent validity of the model’s latent variables (Hair et al., 2014).

Fornell and Larcker (1981) and Heterotrait Monotrait (HTMT) (Henseler et al., 2015) criteria were further used to evaluate the model’s discriminant validity. As shown in Table 3, the square root of the AVE of all variables in the matrix diagonal is greater than the related correlation in corresponding rows and columns, therefore indicating the quality of the reflective model (Hair et al., 2013). For example, the square root of AVE for intellectual engagement (0.842) is higher than the corresponding row correlation (0.368) and column correlation (0.702, 0.697). Therefore, the four latent constructs including self-efficacy, autonomous motivation, peer engagement and intellectual engagement used in the research framework are different from each other, thus suggesting the quality of the measured variables. Finally, we assessed the Heterotrait-Monotrait proportion of associations (HTMT) criteria for each pair of reflective constructs based on the item correlations (Henseler et al., 2015). As shown in Table 4, the outcomes from the correlations of pair of constructs are less than threshold values of HTMT = 0.85 (Gold et al., 2001; Henseler et al., 2015; Teo et al., 2008), we therefore confirmed the model’s discriminant validity.

3.5. Analysis of structural model
The model fit was appraised using the standardized root-mean-square residual (SRMR) composite factor model (Henseler et al., 2015). For the model, SRMR was 0.052 < 0.08, a demonstration of a good model fit (L. T. Hu & Bentler, 1998). The model’s explanatory power (Shmueli & Koppius, 2011) was assessed using the R² criterion. An evaluation of endogenous constructs’ explanatory power shows both intellectual engagement (0.509) and peer engagement (0.565) have strong R² values, while autonomous motivation (0.091) has a weak R² value. The results suggest self-efficacy accounts for 9.1% of variations in autonomous motivation. Additionally, the combined effects of self-efficacy and autonomous motivation explained 50.9% and 56.5% of variations in intellectual engagement and peer engagement, respectively.

To evaluate the predictive accuracy of the tested research model, the Stone-Geisser’s Q² Test (Geisser, 1974; Stone, 1974) was estimated using the blindfolding with an omission distance of 7 (Hair et al., 2011) procedure to calculate the cross validated redundancy measure, Q² for the endogenous constructs (Table 2). As a rule of thumb, Q² values higher than 0, 0.25, and 0.5 depict small, medium, and large predictive relevance of the PLS-path model (Hair et al., 2019). Consequently, Q² value of autonomous motivation (0.060) demonstrating small predictive relevance and intellectual engagement (0.359) and peer engagement (0.369) demonstrating medium predictive relevance. The effect sizes of the main exogenous construct were examined using Cohen’s (1988) f². Our analysis revealed that the magnitude of the effect of self-efficacy on intellectual engagement (f² = 0.772), and peer engagement (f² = 0.884), met a large effect size and autonomous motivation (f² = 0.104), met the threshold of medium effect size. Similarly, effect
of autonomous motivation on intellectual engagement \( (f^2 = 0.074) \) and peer engagement \( (f^2 = 0.057) \) had a near small effect size.

Prior to testing the hypotheses, the variance inflation factor (VIF) was used to check for the collinearity among each set of predictor variables (Hair Jr et al., 2016). As a rule of thumb, VIF
values less than 3 show absence of collinearity. The result in Table 5, indicate that all VIF values of pair of self-efficacy and autonomous motivation are below 3, indicating the absence of collinearity among predictors of peer and intellectual engagement.

The path coefficients of the inner model were evaluated using bootstrap t-statistics, based on 5,000 subsamples, with a bias-corrected bootstrap, testing for a two-tailed significance of 95% (Anderson & Gerbing, 1988). As shown in Table 6, results of the path coefficients and the p-values showed that all the seven path relations were significant.

|                      | AM       | IE       | PE       | SE       |
|----------------------|----------|----------|----------|----------|
| Autonomous Motivation (AM) | 0.815    |          |          |          |
| Intellectual Engagement (IE) | 0.368    | 0.842    |          |          |
| Peer Engagement (PE) | 0.310    | 0.702    | 0.811    |          |
| Self-efficacy (SE) | 0.307    | 0.697    | 0.748    | 0.777    |

4. Discussions

The study examines the mediation effect of autonomous motivation on the relationship between self-efficacy and two types of engagement including intellectual and peer engagement among 512 students from two tertiary institutions. PLS-SEM analyses were employed to validate the proposed structural models and test the associated hypothesized path relationships.

Previous studies have found self-efficacious individuals to be highly engaged (Singh & Abdullah, 2020; Zhen et al., 2017). Similar finding was inductively revealed in this study, suggesting the beneficial and adaptive role of self-efficacy in the academic domain. This finding suggests that students who are self-efficacious are likely to emotionally and cognitively invest and partake in
Table 4. Heterotrait–Monotrait Criterion

|                  | AM  | IE  | PE  | SE  |
|------------------|-----|-----|-----|-----|
| Autonomous Motivation (AM) |     |     | 0.397 |     |
| Intellectual Engagement (IE) | 0.330 |     | 0.767 |     |
| Peer Engagement (PE) | 0.335 | 0.780 |     | 0.823 |
| Self-efficacy (SE) | 0.397 |     |     |     |

Peer and intellectual engagements. The support for self-efficacy and intellectual and peer engagement are consistent with COR theory (Hobfoll, 2002). The finding suggests that self-efficacy provides students with resources and energy that enable them to cope with academic challenges and manage their educational environment (Sweetman & Luthans, 2010). Consistent with the studies of Close and Solberg (2008) and Wang et al. (2008), this study confirms a positively significant relationship between self-efficacy and autonomous motivation. By implication, the results suggest that students’ awareness of their efficacy seem effective in increasing their level of motivation. In confirmation of results of earlier studies, autonomous motivation was found to correlate positively with both intellectual and peer engagement (Froiland & Worrell, 2016; Joo et al., 2013; King et al., 2014). This outcome adds to the rare existing literature showing that autonomous motivation can function as a supportive factor for students’ active intellectual and peer engagement, an interesting relation that needs further scientific investigation. For Ghanaian students, it can be deduced that personal importance of learning might offer students motivation and provides more energy for them to become engaged intellectually and through their peers.

This study further extends the discourse by exploring autonomous motivation as a mediator in the self-efficacy and engagement relationship. Result found autonomous motivation to partially mediate the relationship between self-efficacy and both intellectual and peer engagement. Consequently, autonomous motivation serves as an important mechanism that leverages self-efficacy on engagement. For students, engagement is a necessary norm, and given that engagement is a demanding process, self-efficacy serves as a valuable resource in this context and students who develop self-efficacy beliefs are highly motivated to become engage with their peers and intellectually.

4.1. Implications for theory and practice and limitations of the study

With all the limitations, the present study has made a significant contribution to the higher education literature. According to K.W. Luthans et al. (2016), students with appreciable levels of psychological resources are likely to engage in productive educational activities. Consequently, previous studies have shown a positive and reliable association between self-efficacy and several

Table 5. Collinearity Assessment (Inner VIF Values)

|                  | AM  | IE  | PE  | SE  |
|------------------|-----|-----|-----|-----|
| Autonomous Motivation (AM) |     |     | 1.104 |     |
| Intellectual Engagement (IE) |     |     |     | 1.104 |
| Peer Engagement (PE) |     |     |     | 1.104 |
| Self-efficacy (SE) | 1.000 |     |     |     |
engagement variables (Singh & Abdullah, 2020; Zhen et al., 2017). Though scholars have extensively examined the concept student engagement (Ansong et al., 2017; Ben-Eliyahu et al., 2018; Fraysier et al., 2020), the association between self-efficacy and intellectual and peer engagement among university students rarely attracted attention, especially from sub-Saharan Africa (Ansong et al., 2017). In the present research, we extend the line of student engagement research by examining both intellectual and peer engagement in a Sub-Saharan higher educational context. The findings from the study provide supports for relationship between self-efficacy and intellectual and peer engagement among university students, suggesting self-efficacy is a significant predictor of intellectual and peer engagement, thereby enriching the higher education literature. Additionally, results from the hypothesized relationship explain how interaction of self-efficacy and autonomous motivation positively impacts intellectual and peer engagement. The findings highlight the fact that autonomous motivation enhances intellectual and peer engagement because it positively interacts with student's self-efficacy. The findings suggest that students engage better in their studies if their academic self-efficacy is reinforced by their level of motivation.

The conclusions drawn from the study infer that student's attainment of self-efficacy is key to better engagement. Consequently, it has significant consequences for higher education managers. We recommend that university authorities recognize students' self-efficacy as a vital learning resource, consequently, work in planning, developing and implementing effective and efficient educational policies aim at cultivating students' sustainable self-efficacy. For example, students should be educated on improving their self-efficacy by focusing on past successes. Ajzen (2002) contend that, by focusing on strengths, traits and factors, which contributed to past achievement we can create mastery experiences which can produce better levels of self-efficacy. Additionally, students' self-efficacy can be improved through “vicarious experience” (Bandura, 1977). Thus, students must be offered the opportunity to observe other students succeed on a task. Further,
to facilitate student autonomous motivation, lecturers must provide students choices and options about how to study or do an activity. To achieve this, school authorities must encourage student's autonomy behaviours in lecturers by developing training programmes with explicit instructions and training materials to inspire autonomy-supportive behaviours in lecturers (Girelli et al., 2018).

Research into the interaction between self-efficacy, autonomous motivation and intellectual and peer engagement of students is not without limitations. First, the current investigation applied a cross-sectional design on first-year students which may raise possible issues concerning the validity of research outcome. We recommend that future studies use longitudinal design involving a cohort of students from first to the third year of their schooling to strengthen the claim regarding the association between self-efficacy and optimal educational outcomes. Second, the present research relied on self-report data, future empirical investigations must use other data collection strategies such as peer-report and teacher-report ratings to eliminate the likely problem of self-reporting bias. Finally, the current study was based on a sample from one technical university in Ghana. Hence, future investigations should examine the beneficial impact of self-efficacy among other higher education institutions to provide evidence to support generalization of the findings.

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Data Availability
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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