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Examining the mediating effect of grit on the relationship between perceived autonomy support and academic performance of medical students in Guangzhou China

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Abstract
Recent researchers found that undergraduate medical students experience academic pressure due to less support from teachers and little recreation time. Therefore, the current study aimed at examining the important relationship between perceived autonomy support, physical fitness, and academic performance among medical students. Since, numerous researches raised the concern of poor academic performance of undergraduate medical students. A total of 503 data was collected using stratified random sampling from 4 medical university. Data was gathered using standardized measures. Descriptive statistics and Pearson Product Moment Analysis were run using SPSS software. Results revealed that there is a significant positive relationship between perceived autonomy support, physical fitness, and academic performance. Studies present useful insight for policy makers, stakeholders, and teachers.

Keywords:
Perceived autonomy support, physical fitness, academic performance, and medical students.

I. INTRODUCTION

For the development of a country higher education plays a very significant role (Tekle & Fesshaye, 2017). China's higher education has experienced development in leaps and bounds in the past few decades as China has now become the largest country in terms of the scale of higher education (Shi et al., 2017). Ministry of Education has implemented an assessment of the undergraduate teaching level, which has played a certain role in guaranteeing the infrastructure and teaching levels of colleges and universities. However, this measure is only the basic work or primary stage to determine the credibility of higher education and does not touch core lifeline of the quality of higher education (Zhang et al., 2022) since limited educational resources as compared to country population gave rise to intense academic competition and pressure (Martin et al., 2010). Further, exam oriented educational approaches are used by the teachers which are excessively concerned with their achievement leads to school exhausted emotions, lack of interest in learning (Kirkpatrick & Zang, 2011). In line with this, it has been reported that 20%-60% of students from middle and high school have low dedication for the school (Xueyou Education Network, 2010).

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National Juvenile Internet Use survey (2007) conducted in ten provinces of China found 'too much academic pressure' (66.7%) and 'having too little recreation' (30.3%) among primary and secondary schools' participants and 83.5% reported 'to improve academic achievement' (Chen et al., 2014; Gong et al., 2017; Sun et al., 2012). Hence, the statistics of high graduation are not true representative of academic performance. Therefore, the current study would like to understand the academic performance of undergraduates since very few studies have been conducted (Hu, 2018; Aziz & Traiq, 2019).

Academic performance of the students is contingent on their academic success as it makes them more competitive in the job pool hence higher occupational success (Santana et al., 2017). However, persistent study pressure can lead towards poor academic performance and health (Lin et al., 2020). A recent study on 347 Chinese undergraduate students reported stress as a predictor of lower GPA (Lin et al., 2020) which is often due to the fact that these students think overthink about things to accomplish (Nguyen et al., 2018). Furthermore, the recent statistics of Guangzhou University of Chinese Medicine revealed a decline in the academic performance of undergraduate students in the past four years where in year 2017 (40 out of 119), 2018 (32 out of 138), 2019 (64 out of 139), and 2020 (89 out of 135) students scored less than 3.00 GPA which is of a great concern.

Social environment of students of which teacher is an essential component plays a significant role in developing students' motivation and enhancing classroom engagement, hence, promoting academic performance (Haakma, Janssen & Minnaert, 2017). A person perceives that his/her views are reinforced by the teacher and are provided him/her prospects to get knowledge and make choices (Cho, & Baek, 2020) is known as autonomy support. When teachers demonstrate supportive behaviours, such as giving them autonomy, setting the expectation standards, providing uninterrupted and strong view, and giving various stimulating, exciting, and significant chores (Fredricks et al., 2016), motivating students to study effectively has led to improved performance.

Most of the studies on autonomy support are conducted in Western countries such as Spain (Huéscar Hernández et al., 2020), Estonia (Tilga et al., 2021), US (Simonton, Solmon, & Garn, 2021) with individualistic cultures. Hence, this study will shed light on non-western collectivistic culture. Furthermore, in China the studies on physical fitness are conducted with pre-primary, elementary, middle (Huang, Zeng, & Ye, 2019), or high-school-age students (Zhai et al., 2020; Wang, 2019) whereas, limited literature in the context of medical undergraduate is available. In this way the study will significantly contribute to the body of literature. Therefore, this research aims to examine the relationship between perceived autonomy support, physical fitness and academic performance among undergraduate Chinese medical students at Guangdong Province.

Grit entails "as passion and perseverance for long-term goals" (Duckworth & Gross, 2014, p). Grit includes the determination of individuals to reach their long-term goals and represents the characteristics of perseverance and passion for long-term goals. Grit is positively linked with the productive results for people, indicating satisfaction with work, occupation production, and expressive conclusions (Credé, Tynan, & Harms, 2017). Hence it could be also related to positive outcomes in the educational context, promoting student performance. A recent study of adolescent students demonstrated the positive contribution of grit on student academic performance (Hagger & Hamilton, 2019).

Some research indicate that student grit is influenced by teachers conduct during classes (Huéscar Hernández et al, 2020). Specifically, how students perceived teacher-induced autonomy supportive behaviours. It is hypothesized that if a teacher finds the specific dispositional traits of each student

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and knows how to nurture the inherent interest of the students and reborn their proactivity towards learning activities, then a chain of positive outcomes can ensue (Huéscar Hernández et al, 2020). Furthermore, research on the relative contributions of grit to student academic performance outcomes have been limited. The bulk of research conducted to date has examined grit through direct effect on student academic performance (Moles, Auerbach, Petrie, 2017). However, this study will examine the potential impact of perceived autonomy support and the mediating role of grit on student academic performance.

RESEARCH QUESTIONS

Based on the problem highlighted the current study formulated following research questions

RQ1: What is the relationship between perceived autonomy support and academic performance?

RO2: How grit mediate the relationship between perceived autonomy support and academic performance?

II. LITERATURE REVIEW

Perceived Autonomy Support and Academic Performance

Class activities are guided and regulated by the teachers who are constantly in touch with the students and play a very important role for providing support. Support provided by the teachers to the students usually include autonomy support, cognitive support and emotional support (Feng et al., 2019). When a teacher considers the students' opinion, thoughts/feelings, and provides them an opportunity to learn and choose, as well as reinforces the problem solving and thinking, this is termed as autonomy support (Feng et al., 2019). Providing learning techniques, guidance for the problem solving, giving productive assignments and feedback is termed as teachers' cognitive support (Li et al., 2020). Whereas the emotional support provided by the teachers include addressing the negative emotions of the students, having a caring attitude, and feelings of being connected to the students (Titsworth et al., 2010).

The teachers' encouragement for autonomy in classes refers to the behaviour the teacher provides during instruction first to identify, then to vitalize and nurture, and eventually to develop, strengthen, and grow students' inner motivational resources (Reeve, 2016). Such kind of teaching style that encourages autonomy include the consideration of students view point and opinion and giving them freedom of choice concerning learning and school activities (Reeve, 2016). So when students are encouraged for autonomy they develop the feelings of being respected and encouraged for their efforts and understood by the teachers (Reeve, 2009).

In China, the teachers role is very significant for the development of adolescent behaviours (Zhou & Li, 2015). Perceived autonomy support is defined as the freedom and support provided by the teachers to provide choices to the students, encouraging their problem solving efforts and participating in their decisions, recognise their feelings, and dodge forming unnecessary stress (Reeve et al., 2004). In a research considered that investigated connection between teacher support for proving students' autonomy at school and immigrant adolescents' psychological health, found that when teachers are perceived as adopting an approach that is supportive of autonomy, immigrant adolescents report significantly higher levels of psychological wellbeing (Alivernini et al., 2019). Overall, the findings suggest that interventions of enacted support by teachers at school that aim to foster students' autonomy would be an effective approach for uplifting psychological wellbeing in immigrant adolescents (Alivernini et al., 2019). So, based on past studies, the first hypothesis of the study is:

H1. There a significant relationship between perceived autonomy support and academic performance of undergraduates.

Grit and Academic Performance

In education a recent concept is

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found which is Grit. According to Duckworth, grit is defined "as passion and perseverance for long-term goals" (Duckworth & Gross, 2014). Grit refers to the level of drive that individual demonstrates in order to reach their goals over the long term and reflects trait-level perseverance and passion for long -term goals. Hence, grit involves working hard towards challenging objectives and maintaining effort and interest over years, despite failure, set-backs, and plateaus in progress. Grit is positively associated with adaptive outcomes among youth and adults, such as work satisfaction, career performance, and emotional outcomes (Credé, Tynan, & Harms, 2017). Hence it could be also related to positive outcomes in the educational context, promoting student performance. Grit is a psychological construct which focuses on the individuals' persistent efforts and dedication for long-term goals (Duckworth & Quinn, 2009). Grit levels, therefore, may reflect applicants' degree of commitment to achieving long-term goals, overcoming obstacles, effectively managing failure, and self-motivating even in the absence of extrinsic motivations (Duckworth & Quinn, 2009).

In a recent study of adolescent students, Hagger and Hamilton demonstrated the positive contribution of grit on student academic performance (Hagger & Hamilton, 2019). "Gritty" students were those who invested a great deal of time in remaining connected to task goals and thus were more likely to engage in deliberate behaviours that would enable them to achieve these goals. This line of research is consistent with expectations from grit theorists, showing the importance of measuring grit as a predictor of performance (Miller-Matero et al., 2018). Of the two grit characteristics, research findings tend to indicate perseverance as a relatively stronger predictor in the attainment of long-term goals, including under adverse circumstances which would include objective failure or the feeling that one is not continuing to improve, compared to passion (Huéscar Hernández et al., 2020).

In line with these findings, Guo and colleagues in their research found differentiated correlation patterns between grit factors and motivation (Guo, Tang & Xu, 2019). Overall, the link between grit and academic performance remains under-researched. Although grit would seem to be a fundamentally important quality in a dynamic context as what the educational setting is, the influence of other social forms that may interact with grit are not well understood. Some research indicate that student grit is influenced by teachers conduct during classes (Duckworth & Quinn, 2009).

Specifically, how students perceived teacher-induced autonomy supportive behaviours. It is hypothesized that if a teacher finds the specific dispositional traits of each student and knows how to nurture the inherent interest of the students and reborn their proactivity towards learning activities, then a chain of positive outcomes can ensue. In accordance with the findings of Reeve and colleagues, it would be anticipated that perceived autonomy support for students would strengthen student intrinsic goals and reinforce student behaviours that is effortful, goal-directed, and reliant upon personal resources and intrinsic motivation (Von Culin, Tsukayama, Duckworth, 2014).

Overall, the link between passion and perseverance and academic performance remains under-researched. Although grit would seem to be a fundamentally important quality in a dynamic context as what the educational setting is, the influence of other social forms that may interact with grit are not well understood. Some research indicate that student grit is influenced by teachers conduct during classes (Duckworth & Quinn, 2009). Specifically, how students perceived teacher-induced autonomy supportive behaviours. It is hypothesized that if a teacher finds the specific dispositional traits of each student and knows how to nurture the inherent interest of the students and reborn their proactivity towards learning activities, then a chain of positive outcomes can ensue. In accordance with the findings of Reeve and colleagues (Ryan & Deci, 2017), it

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A better understanding of the potential influence of grit between teacher need-supportive behaviour and student academic achievement outcomes would help to clarify these effects. Hence, the current study wanted to examine the mediating role of grit between perceived autonomy support and academic performance.

CONCEPTUAL FRAMEWORK

The self-determined theory (SDT) explains a learner's level of motivation is positioned on the continuum polarized by intrinsic motivation (i.e., undertaking an activity for its own sake) and amotivation (i.e., lack of any motivation) (Deci and Ryan, 1985; Ntoumanis, 2001). Along the continuum, from the more self-determined to the less self-determined, are four levels of extrinsic motivation: integrated regulation, identified regulation, introjected regulation, and external regulation (Deci and Ryan, 1985).

The construct of grit is very similar to Bandura's (2001) concept of agentic thinking. Agency is defined as the embodiment of belief systems that allow an individual to develop and adapt over time. "To be an agent is to intentionally make things happen by one's actions" (Bandura, 2001). Grit refers to passion and perseverance for long-term goals despite failure or setbacks. Grit involves maintaining interest and passion over years even if initially unsuccessful (Duckworth et al., 2007). Both concepts featured primarily cognitive elements with other interacting variables supporting and interacting with features of behaviour. Agency takes personal, behavioural, and environmental factors into account while grit has mostly been studied at the personal and behavioural levels (Duckworth et al., 2009; Maddi, Matthews, Kelly, Villarreal, & White, 2012; Salles, Cohen, & Mueller, 2014; Strayhorn, 2014).

Grit, as defined by Duckworth et al. (2007), is similar in nature. The passion, determination, and dedication to reach a long-term goal suggests a great deal of internal motivation. The outcomes of the application of grit may be greater career success, higher academic achievement, and greater psychological well-being (Salles et al., 2014; Strayhorn, 2014); these outcomes are important in the development of individuals and for a healthy, productive society (Diener & Tov, 2009; Diener, Ng, & Harter, 2010). Hence, we propose that there will be a significant mediating relationship between grit, perceived autonomy support and academic performance.

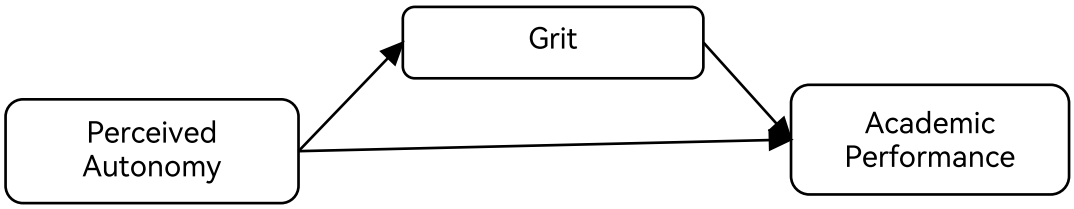

Figure 1 Conceptual Framework of the study

III. METHODOLOGY

Research design

Correlational survey design was used to collect the required information from medical students at one point in time (Edmonds & Kennedy, 2016). This technique is chosen as survey is suitable (Fowler, 2013) due to their structured formats, help researcher to collect large amount of data in a short period of time, and statistical hypothesis can be more objectively analysed (Harwell, 2011).

Sampling

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Stratified random sampling technique was used to select a suitable sample of students in the 4 local medicine universities due to the large population. Krejcie and Morgan (1970) defined the sample size as the number of subjects decided to represent the population. Therefore, sample size for the study was made according to the Table for Determining Sample Size from a Given Population made by Krejcie and Morgan (1970). Because the population of this study is over one hundred thousand, the minimum sample size of the field study is 384. However, usually, the number of questionnaires distributed is larger than the minimum sample size because of the response rate and valid rate. According to Hao (2019), an extra 30% of questionnaires will be added and this makes up the number of questionnaires in the field test to 384*(1+30%) =499.

Instruments

Personally administered questionnaire has been used as a research tool in the current study. It is a self-explanatory survey where reading the instructions is necessary, and the respondent fills it in on his own, away from the researcher (Fowler, 2009). There were two sections in the questionnaire Section A includes the demographic questions about the respondents. Section B consisted of standardized tool to measure Grit, PAS and acadmic performance.

Perceived Autonomy Support

Multidimensional Perceived Autonomy Support Scale (Tilga et al., 2017) was used. The instrument is preceded by the statement "My teacher...." It is composed of 15 items grouped into five items per factor to measure cognitive, procedural, and organizational autonomy support. The response for each item is collected through a 7-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). A high average score in each dimension would, respectively, indicate a high perception in terms of cognitive, procedural, and organizational autonomy support from teachers.

Grit

The Grit Scale short version will be used to measure passion and perseverance students have towards the classroom setting (Duckworth & Quinn, 2009). Items were adapted to the classroom context, namely grit for passion ("I often set a goal but later choose to pursue a different one") and grit for perseverance ("Setbacks do not discourage me. I do not give up easily"). Participants will respond to eight items (four each factor) using a 5-point scale anchored from 1 (totally disagree) to 5 (totally agree).

Academic Performance

The academic performance was measured by using the Grade Point Average (GPA) from the first semester of the academic year 2020 -2021.

Data Collection

Official permission was be sought before collecting data from the university. University administration were personally contacted, and objectives of the study were explained. An informed consent was attached that explained the purpose of the study and confidentiality of the participants were assured. Questionnaires distributed to the students through Wenjuanxing. Researcher provided its contact details so that if the participants have any queries they can ask.

IV. RESULTS

Preliminary Analysis

Before proceeding to hypothesis testing some preliminary analysis were administered. For example, missing data occurrence is one of the most unavoidable problems in data analysis, and can have a significant effect on the conclusions that can

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be drawn from the data. Therefore, to prevent the missing data problem in the current study, all the respondents were given ample time to respond to the questionnaire, and the researcher checked each questionnaire carefully while collection. Therefore, there were the least possibility of missing data at the item-level during the field data collection procedure.

The Mahalanobis Distance (D2) was used to identify multivariate outliers. The value of the Mahalanobis Distance of the 503 samples was conducted using SPSS software and compared against the baseline value established in the Chi-square table (Tabachnick & Fidell, 2019). As totally 53 items were adapted in the three variables of this study, it stands for the degree of freedom in the $\chi 2$ table with $p < 0.001$, so the reference point was 106.22. Upon checking the analysis result, none of the cases in the field study data set had a value larger than 106.22.

Normality of data was measured normality which skewness and kurtosis. Skewness values falling within the range of -1 to +1 indicate that the data do not depart from normality thus are feasible for parametric tests. In the present study Skewness and Kurtosis values of the variables with normal distribution. Skewness of four variables ranged between -0.39 and -1.42, and kurtosis was within the range between 1.12 and 3.39.

Hypothesis Testing

Demographics aims to furnish information of a population. In this study, the descriptions of the university students from local application-oriented universities collected are: gender and age.

Table 1 Demographic Characteristics of the Respondents (N=503)

Profile	Frequency	Percent (%)
Gender		
Male	277	55.1
Female	226	44.9
Age		
18 and below	210	41.7
19-22	213	42.3
23 and above	80	15.9

Of all the respondents, 55.1 % were male and 44.9% were female. The most common levels of age were 18 and below (41.7%), 19-22 (42.3%) and 23 and above (15.9%).

Pearson correlation was used to measure the existence (given by a p-value) and the strength (given by the coefficient r between -1 and +1) of a linear relationship between two variables. According to Cohen (1988), an absolute value of r of 0.1 is classified as small, an absolute value of 0.3 is classified as medium and of 0.5 is classified as large. In another word, the effect size of absolute r value between 0.1-0.3 is small, between 0.31 and 0.5 is medium, and greater than 0.5 is large.

Table 2 Correlation among study variables

Variables		PAS	Grit	AP
Perceived Autonomy Support (PAS)	Pearson Correlation	1	.71**	.28**
Grit	Pearson Correlation		1	.08
Academic Performance (AP)	Pearson Correlation			1

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**Correlation is significant at the 0.01 level (2-tailed).

The results of the present study revealed significant positive relationship among all study variables.

To determine that grit mediates the relationship between perceived autonomy support and academic performance path analysis using SEM was used. According to the fitness indices of the structural results, this proposed structural model of grit as a mediator achieved the required goodness of fit. Specifically, Normed Chi-square = 2.10 < 3.0, CFI = 0.97 > 0.90, GFI = 0.91 > 0.90, AGFI = 0.94 > 0.90, RMSEA = 0.01 < 0.08, NNFI = 0.92 > 0.90. The subsequent results were obtained as displayed in Table 3. Meanwhile, the squared multiple correlation for perceived autonomy support, grit and academic performance was 0.87. This displayed that 87% of the variance in academic performance could be predicted by perceived autonomy support and grit. This also showed that as much as 13% of the variance in academic performance was unable to be predicted by perceived autonomy support and grit among university students.

Table 3 Mediation Analysis Result

Construct	Path	Construct	ß Estimate	S.E.	C.R.	p-Value	Result
Grit	<---	PAS	.17	.01	2.72	.00	Significant
AP	<---	Grit	.13	.05	2.82	.00	Significant
AP	<---	PAS	.85	.03	9.02	***	Significant

V. Conclusion:

1. Both hypotheses testing for perceived autonomy support to grit, and grit to academic performance are significant [indirect effect].
2. Hypothesis testing for perceived autonomy support to academic performance is also significant [direct effect].
3. The type of mediation is partial mediation.

The value of 0.17 × 0.13 = 0.04 < 0.85. that is the value of a × b < c. Both the hypotheses testing for the indirect effect between perceived autonomy support to grit, and grit and academic performance are significant. The direct effect result of perceived autonomy support to academic performance is also significant. Hence, the type of mediation is partial mediation. Based on the mediation analysis result, it can be concluded that grit mediates the relationship between perceived autonomy support and academic performance.

VI. DISCUSSION

Perceived autonomy support was found significantly and positively correlated with academic performance. Some previous findings also have shown that perceived autonomy support was strongly correlated with academic performance (Martinek et al. 2022; Wang & Hu, 2022; Okada, 2022). Using different instruments of perceived autonomy support and academic performance, Martinek et al. (2022) did a study among 812 students. They discovered a significant link between perceived autonomy support and academic performance. In a study involving 12058 students, Wang and Hu (2022) looked into the relationship between reading proficiency and felt autonomy support. According to the findings, when students believe their teachers promote their autonomy, internal control, value assessments, and academic satisfaction are

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all considerably positively related to students' reading proficiency.

Similarly, current study found a mediating effect of grit between the relationship of PAS and AP which is consistent with the past literature that found that student grit is influenced by teachers conduct during the classes. Specifically, how students perceived autonomy support from their teachers. Reeve and colleagues (Reeve & Cheon, 2021) highlighted the fact that perceived autonomy support for students would strengthen student intrinsic goals. Hence, in other terms their grit is boosted which reinforce student to put more effort in his learning

VII. SIGNIFICANCE AND FUTURE DIRECTION

Findings of the present study will be helpful for teachers since they can observe from the study findings the important role autonomy in fostering self-initiative and mental and physical self-development among students which significantly influence the academic performance. Teachers will be able to plan suitable strategies to enhance students' autonomy, PF in improving academic performance. Furthermore, findings from this study will help students to understand the importance of PF and teacher autonomy support in enhancing their physical and cognitive abilities. Thus, students will be more aware of the benefits and focus more on these aspects as to enhance their academic performance.

Even though the present study is significantly important however, there are certain limitations of the study. The data for the current study was gathered from Medicine universities which is one of the largest and oldest universities in the province. However, gathering data from other province might provide different findings. Moreover, data will be collected using self-administered questionnaire which may reduce the insight into the study. Due to time and cost limitation, using observation and interviews are not possible although they will provide a deeper insight into the study. Finally, the data will be gathered from undergraduate students using cross sectional research design which will limit the understanding of the phenomenon over the period of time. Since, using longitudinal research design more predictors of academic performance could be found.

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