



Assessment of Academic Grit among Biological Sciences Undergraduates in a Nigerian University

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Abstract

This study assessed academic grit among Biological Sciences undergraduates in a Nigerian university. A descriptive survey research design was adopted, and simple random technique was used to select a total sample of 1,030 undergraduate students from the Department of Biological Sciences at Tai Solarin Federal University of Education, Ogun State, Nigeria. One research question and two research hypotheses guided the study. Descriptive statistics, including means, frequency counts, and percentages, were used to address the research questions, while inferential statistics, specifically independent t-test and one-way ANOVA, were employed to test the hypotheses at a 0.05 level of significance. The findings revealed that undergraduate Biological Sciences students exhibited high levels of academic grit across the subscales: Determination (21.73 ± 3.24), Resilience (21.71 ± 3.23), Focus (20.71 ± 3.58), and overall (64.15 ± 8.99). Additionally, significant differences in academic grit levels were observed based on students' academic levels across all subscales and overall ($p < .05$). Furthermore, significant gender differences in academic grit were found across all subscales and overall ($p < .05$). Based on these findings, it was recommended that policymakers should organize a variety of events, including seminars, conferences, workshops, orientation programs, and induction sessions to foster academic grit among biology undergraduates. Moreover, activities aimed at enhancing students' focus should be incorporated.

Keywords: Academic Grit, Biological Sciences, Undergraduates

1. Introduction

Grit is a distinctive, non-intellectual quality that fuels a person's inner motivation to overcome difficult challenges in pursuit of a goal. Studies show that grit often leads to improved outcomes in education and work, including higher academic grades and better job performance (Thomas et al., 2018; Vazsonyi et al., 2019). According to Stoffel and Cain (2018), grit comprises two main components: a consistent, unwavering interest and persistent effort toward long-term goals despite obstacles and setbacks. Maintaining steady engagement means sustaining your interest over time, while perseverance and effort are demonstrated by overcoming obstacles and continuing after setbacks, such as completing a project despite multiple delays (Stoffel & Cain, 2018).

Studies indicated that grit is closely associated with experiencing happiness and life satisfaction, akin to the lasting pride felt after completing a challenging task (Datu et al., 2019; Schimschal et al., 2022). Grit involves maintaining commitment to what matters, staying focused, and persevering through difficulties long enough to achieve significant goals (Schmidt et

al., 2019). Individuals with grit remain dedicated to their tasks, keep their goals in sight, and continue working until completion, even when faced with obstacles (Singh & Chukkali, 2021). Grit influences how students endure late-night study sessions and carry that determination into their professional lives. It plays a crucial role in career development and often predicts future success, acting like steady hands that guide a project to its completion (Kannangara et al., 2018; Mason, 2018). Students who possess strong grit engage deeply with their work, maintain concentration, and tend to complete tasks ahead of deadlines (Hodge et al., 2018).

Grit in a person encompasses several aspects: passion (strong enthusiasm and dedication toward an activity), deliberate practice (persistent and focused effort to improve and master a skill), a sense of purpose (having clear life goals), and hope (the belief that efforts will lead to the best possible outcomes). Additionally, factors such as parenting, the environment in which grit develops, and the culture surrounding grit are also connected to these traits (Duckworth et al., 2007; Park et al., 2018).

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Grit is a distinct and independent trait that is crucial for accomplishing long-term objectives (Vazsonyi et al., 2019). A high level of grit can help students become proficient graduates in their areas of expertise (Bazelaïs et al., 2016; Duckworth et al., 2007).

Students with greater grit tend to be more engaged, which results in improved academic performance (Hodge et al., 2018). Those with higher grit scores achieve better academically compared to their lower-grit peers. Therefore, students with strong grit are diligent, productive, persistent during challenging times, and capable of completing multiple demanding tasks (Mason, 2018). Grit is an essential factor for success (Al-Mutawah & Fateel, 2018; Bozgun & Basgul, 2018). It can be described as a personal commitment to achieving a long-term goal (Mohan & Kaur, 2021). Individuals with more grit tend to be more persistent, hardworking, motivated to pursue long-term goals and projects, and better able to maintain focus (Bazelaïs et al., 2016).

Research on gender differences in grit scores remains inconsistent and subject to debate due to varying results (Eskreis-Winkler et al., 2014; Ali & Rahaman, 2012; Duckworth & Quinn, 2009; Duckworth et al., 2007). However, studies by Sigmundsson et al. (2020, 2021) found no significant differences in grit between males and females. Christensen and Knezek (2014), using a 12-item grit scale with 151 high school students in the United States, reported a significant difference between female and male students. Similarly, research by Gorman (2015) and Gumus (2021) on high school students, Porter (2019) and Rusadi et al. (2021) on undergraduates, and Serin (2021b) on fourth graders all indicated that gender does not influence grit. Conversely, studies involving postgraduate students by Suhruth and Deb (2017), and undergraduates by Kannangara et al. (2018) found that female students exhibit higher levels of grit. Studies show that the key aspect of grit, which is perseverance of effort, is linked to better academic performance and staying enrolled in school. This determination enables biology students to stay involved with difficult subjects instead of giving up when they face tough concepts (Christopoulou et al., 2018). Also, grit enables students to persist through experimental challenges and remain committed to scientific inquiry. Since experiential learning often involves iterative problem-solving, students with higher levels of grit are more likely to refine their techniques and learn from their mistakes (Li & Li, 2021). Having examined the concept of grit, this study assessed academic grit among Biological Sciences undergraduates in a Nigerian university.

1.1 Research Objectives

The objectives of the study were to:

- i. Assess the academic grit level of Biological Sciences undergraduates.
- ii. Determine the differences in academic grit levels among Biological Sciences undergraduates across different academic levels.
- iii. Evaluate the levels of academic grit among Biological Sciences undergraduates based on gender.

1.2 Research Question

The following research question guided the study:

1. What is the academic grit level of Biological Sciences Undergraduates?

1.3 Hypotheses

The following hypotheses were tested for this study:

1. There are no significant differences in academic grit levels among Biological Sciences undergraduates across different academic levels
2. There are no significant differences in the levels of academic grit among biological Sciences undergraduates based on gender

2. Literature Review

2.1 The Concept of Academic Grit

Academic grit is a term used by Korean scholars to describe the concept of grit within the educational context. Grit, a psychological concept introduced by Duckworth, refers to the ability to maintain passionate effort and perseverance by continuously striving to overcome failures and frustrations encountered in learning and work performance (Duckworth & Quinn, 2009; Duckworth, 2016). Academic grit can be understood as a sustaining force that requires a positive mindset and determination to reach academic goals and achieve success (Lim, 2017a). According to Lim and Cho (2018), academic grit consists of three components: passion for learning, persistence, and perseverance. These include sub-factors such as academic enthusiasm and passion. Achieving success in educational fields can be challenging, but maintaining interest helps prevent a decline in academic engagement. Persistent effort helps students overcome difficulties and setbacks, contributing to consistent academic achievement and outcomes. These experiences are developed throughout the academic year (Credé et al., 2017; Perkins-Gough, 2013; Tough, 2012; Vainio & Daukantaitė, 2016).

2.2 The Theory of Grit

The concept of grit was first introduced by Duckworth et al. (2007). Grit, as a personality trait, combines passion and persistence toward achieving long-term goals or positive outcomes. Duckworth (2016) further elaborated on this concept, identifying two key components of grit: passion and perseverance. Passion refers to the consistency of interests, while perseverance denotes sustained, enduring dedication and continuous effort. This trait involves maintaining determination and persistence in the face of challenges and difficulties. Grit is a relatively recent concept in personality psychology and has generated a substantial body of research identifying it as a predictor of numerous positive outcomes (Ion et al., 2017). A review by Datu et al. (2018) provides evidence that many studies have linked grit to a wide range of positive outcomes, particularly in the workplace and classroom settings. These outcomes include improved job performance, academic success, increased effort and involvement, enhanced self-perception and self-management, perseverance with challenging tasks, and greater enthusiasm within the school environment, among others. The implication of this theory for

biology undergraduates is that students who are able to withstand challenges and are passionate will perform well academically, whereas the opposite is true for students who cannot endure challenges and lack passion for their studies.

2.3 Self-Determination Theory (SDT) of Motivation

Individual motivation arises from both internal (intrinsic) and external (extrinsic) sources. For a college student, intrinsic motivation originates within the student and includes factors such as health, intelligence and aptitude, interest, internal drive, and learning style. In contrast, extrinsic motivation stems from the school environment, society, and family (Chue & Nie, 2016). Self-Determination Theory (SDT) assesses whether an individual's commitment and motivation to achieve goals are primarily intrinsic or extrinsic. Deci and Ryan (1985, 2008) concluded that there is a positive relationship between intrinsic motivation, learning, and achievement. Moreover, intrinsically motivated students tend to persist even when faced with difficult tasks or challenging conditions. SDT also explains variations in students' learning strategies and academic performance. Zhou (2015) further noted that SDT and personality factors are positively correlated with academic performance. The implication of this theory is that a self-determined student will be motivated to perform well academically, whereas a student who lacks determination is less likely to succeed academically.

3. Methodology

3.1 Research Design

This study adopted descriptive survey research design

3.2 Population of the Study

The population consisted of one thousand seven hundred and fifty two (1,752) Biological Sciences undergraduates from the College of Science and Information Technology at Tai Solarin Federal University of Education, Ogun State, Nigeria.

3.3 Sample and Sampling Techniques

The sample consists of one thousand and thirty (1,030) undergraduates from the Department of Biological Sciences, College of Science and Information Technology, Tai Solarin Federal University of Education, Ogun State, Nigeria. The sample was selected using a simple random sampling technique.

3.4 Instrument for Data Collection

An adapted scale titled the Academic Grit Scale by Clark and Malecki (2019) was used as the instrument for data collection. The scale originally consisted of 30 items, which were subsequently subjected to validity and reliability testing. This process reduced the number of items to 15, which were finally modified and adapted for this study. The instrument consists of two sections. Section one gathers demographic information from the respondents. Section two contains 15 items designed to assess the respondents' level of academic

grit, based on three subcategories: Determination, Resilience, and Focus. Responses are recorded on a five-point Likert scale: Not at all like me (1), Not much like me (2), Somewhat like me (3), Mostly like me (4), and Very much like me (5).

3.5 Validity and Reliability of Research Instrument

The instrument was validated by three science education experts from the Biological Sciences Department at Tai Solarin Federal University of Education, Ijagun, Ogun State. Their suggestions, provided after the face validity assessment, were incorporated into the instrument, which was then finalized for data collection. The reliability of the instrument was assessed with 100 undergraduates from the target population using Cronbach's alpha. The data yielded the following reliability coefficients: .73 (Determination), .83 (Resilience), .77 (Focus), and .90 (Overall Academic Grit). These results indicate that the instrument is reliable for this study.

3.6 Method of Data Collection

After obtaining the necessary permission, the instrument, coded for online use, was distributed to the respondents' class groups. This process was monitored by the level advisers, who are also lecturers in the Biological Sciences Department. They served as research assistants, providing guidance on how and when to complete the instrument. Additionally, they addressed any questions raised by the respondents regarding unclear areas. Upon completion, a total of one thousand and thirty (1,030) responses were collected.

3.7 Method of Data Analysis

Data retrieved from the online survey were coded and analysed using descriptive statistics, including mean, frequency counts, and percentages. These descriptive statistics were employed to address the research question guiding the study, while inferential statistics, specifically t-tests and ANOVA, were used to test the hypotheses. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 20.

4. Results

Table 1 presents the demographic information of participants based on gender, age, academic level, and program of study. The gender analysis revealed that 234 males, representing 22.7%, and 796 females, representing 77.3%, participated in the study. This indicates that a higher number of female students took part in the study. Age analysis showed that 493 students (47.9%) were between 16 and 20 years old, while 537 students (52.1%) were 21 years or older. Regarding academic level, 409 students (39.7%) were in 200L, 306 students (29.7%) were in 300L, and 315 students (30.6%) were in 400L. Finally, the program of study analysis indicated that 442 students (42.9%) were enrolled in Biology, while 588 students (57.1%) were enrolled in Biology Education.

Table 1: Demographic Information of Participants

	Frequency	Percentage (%)
Gender		
Male	234	22.7
Female	796	77.3
Age		
16-20 years	493	47.9
21 years and above	537	52.1
Academic Level		
200L	409	39.7
300L	306	29.7
400L	315	30.6
Programme of Study		
Biology	442	42.9
Biology Education	588	57.1

Table 2: Academic Grit Level of Biological Sciences Undergraduates

	N	Minimum	Maximum	Midpoint	Mean	Std. Deviation
Determination	1030	5	25	15	21.73	3.235
Resilience	1030	5	25	15	21.71	3.228
Focus	1030	5	25	15	20.71	3.582
Academic Grit	1030	15	75	45	64.15	8.994

KEY: N- Total number of Participants; **Std. Deviation-** Standard Deviation

Research Question 1: What is the academic grit level of Biological Sciences Undergraduates?

Table 2 shows academic grit level of biological sciences undergraduates. The result shows that the highest mean was recorded for Determination subscale (M= 21.73), followed by Resilience (M= 21.71) and Focus (20.71). The overall mean value shows that the academic grit level of the students was high (M= 64.15, Std. = 8.994) because the mean value (64.15) was higher than the midpoint value of 45.

Hypothesis 1: There are no significant differences in academic grit levels among Biological Sciences undergraduates across different academic levels.

Table 3 shows the means scores of the academic grit levels among Biological Sciences undergraduates across different academic levels. The result showed that 200L students had highest academic grit level in all the subscales of academic grit followed by 300L and finally 400L. In addition, significant differences was recorded for all the subscales ($p < .05$). It was also revealed from the table that there was significant difference in the overall academic grit level of the students across different academic levels ($p < .05$).

Hypothesis 2: There are no significant differences in the levels of academic grit among biological Sciences undergraduates based on gender

Table 4 shows the means scores of the academic grit

among biological sciences undergraduates based on gender. The result showed that female undergraduate students had higher academic grit level in all the subscales of academic grit compared to the male students. In addition, significant differences was recorded for all the subscales ($p < .05$). The mean scores generally for male and female students are 62.28 ± 10.00 and 64.69 ± 8.60 respectively revealing that female students had higher academic grit level compared to the male students. It was also revealed from the table that there was significant gender difference in the overall academic grit level of the students ($p < .05$).

5. Discussion of Findings

This research found that biology undergraduate students exhibit a high degree of academic grit. This indicates that these students are persistent, goal-oriented, and capable of sustaining effort despite facing academic challenges. These findings align with those of Elnaem et al. (2023), who reported elevated grit levels among pharmacy undergraduates from 14 countries in Asia and the Middle East, suggesting that students in demanding science fields often demonstrate strong determination and passion for achieving long-term objectives. Similarly, Sigmundsson et al. (2021) identified grit as a crucial psychological trait influencing students' motivation and academic performance. Hacısalıhoğlu et al. (2020) emphasized that fostering grit and a growth mindset can enhance student success in STEM education. Our finding that biology undergraduate students exhibit a high degree

Table 3: Mean Scores of the Academic Grit Level among Biological Sciences Undergraduates based on Academic Level

	Level	N	Mean	SD	df	Mean Square	F	Sig
Determination	200L	409	22.01	3.370	2	51.804	4.989	.007
	300L	306	21.82	2.985	1027	10.383		
	400L	315	21.26	3.248				
Resilience	200L	409	22.05	3.413	2	51.380	4.970	.007
	300L	306	21.69	2.991	1027	10.337		
	400L	315	21.29	3.160				
Focus	200L	409	21.27	3.525	2	127.474	10.111	.000
	300L	306	20.59	3.445	1027	12.608		
	400L	315	20.09	3.683				
Academic Grit	200L	409	65.33	9.323	2	644.504	8.076	.000
	300L	306	64.10	8.330	1027	79.801		
	400L	315	62.64	8.982				

KEY: N- Total number of Participants; SD- Standard Deviation; df- Degree of Freedom; F- the ratio of the between-group variance to the within-group variance; Sig- Significance level.

of academic grit is consistent with the findings of Zawodniak et al. (2021) which demonstrated a relatively high level of grit among all the respondents. Conversely, this study contrasts with the conclusions of Kannangara et al. (2018), who found low levels of grit among university students and noted that grit does not consistently predict academic success in higher education.

The results of this study demonstrated statistically significant differences in academic grit among Biological Sciences undergraduates across different academic levels. Specifically, students at the 200 level recorded the highest mean scores across the academic grit subscales, followed by those at the 300 level, whereas 400 level students exhibited the lowest mean scores. The observed variation in overall grit suggests that academic grit is not constant throughout undergraduate training but differs according to stage of study. These findings are consistent with prior empirical evidence indicating that grit may fluctuate across the university trajectory. For instance, Kannangara et al. (2018) reported significant variations in grit by year of study and age among undergraduates, suggesting that grit is a dynamic rather than a fixed trait and may evolve as students' progress academically. Similarly, Martin (2022) observed differences in grit between early and later stages of university education, attributing such variations to shifts in motivation and self-regulated learning over time. Evidence from health-related disciplines further corroborates these patterns; Terry and Peck (2020) found that grit increased with academic level among nursing students, while Elnaem et al. (2023) also reported significant differences in grit across years of study. In contrast, Galaleldin and Anis (2019) found no significant differences in grit across academic levels

and reported that grit did not predict performance differences between first-year and senior students. Such inconsistencies across studies suggest that the development of grit may be context-dependent and influenced by disciplinary demands, cumulative academic stress, fatigue, or changes in academic motivation over time. Collectively, these findings underscore the importance of contextual and educational factors in shaping students' non-cognitive attributes.

There were notable gender differences in the academic grit of Biological Sciences undergraduates. Our results align with those of Christensen and Knezek (2014), who used a 12-item grit scale and found that female students in the United States scored significantly higher than males. The higher average scores among females may be attributed to women's greater proficiency in certain skills linked to increased grit, such as multitasking (Kuptsova & Ivanova, 2016). Research involving postgraduate students by Suhruth and Deb (2017) and undergraduates by Kannangara et al. (2018) also concluded that female students exhibit higher levels of grit. However, the studies by Sigmundsson et al. (2020, 2021), which found no significant gender differences in grit, contradicts our finding that there were significant gender differences in the academic grit of Biological Sciences undergraduates. Similarly, research by Duckworth and Quinn (2009) on students aged 11 to 17, Gorman (2015) and Gumus (2021) on high school students, Porter (2019) and Rusadi et al. (2021) on undergraduates, and Serin (2021b) on fourth graders all concluded that gender does not influence grit. Studies that do not support our results have also been documented in various other research (Yuce, 2023; Credé et al., 2017).

Table 4: Mean Scores of the Academic Grit Level among Biological Sciences Undergraduates based on Gender

	Gender	N	Mean	SD	Mean Difference	Std. Error Difference	T	df	Sig
Determination	Male	234	21.24	3.604	-.630	.240	-2.627	1028	.009
	Female	796	21.87	3.106	-.630	.260	-2.423	341.065	
Resilience	Male	234	21.06	3.594	-.839	.239	-3.516	1028	.000
	Female	796	21.90	3.088	-.839	.259	-3.237	340.401	
Focus	Male	234	19.97	3.860	-.948	.265	-3.578	1028	.000
	Female	796	20.92	3.469	-.948	.281	-3.376	350.998	
Academic Grit	Male	234	62.28	10.008	-2.417	.665	-3.635	1028	.000
	Female	796	64.69	8.604	-2.417	.722	-3.348	340.536	

KEY: N- Total number of Participants; SD- Standard Deviation; **Std. Error Difference**- Standard Deviation Error Difference; **t**- Calculated differences in unit of standard error; **df**- Degree of Freedom; **Sig**- Significance level

6. Conclusion

It can be concluded from the findings of this study that a student's academic level plays a role in determining their academic grit. Additionally, gender significantly influences the academic grit of biology undergraduates. However, this study is limited by the relatively small number of male participants compared to female participants. Although significant gender differences were found across all subscales, a larger sample with more male participants could provide a clearer understanding of gender differences in academic grit.

7. Recommendations

1. Policymakers should offer a variety of events including seminars, conferences, workshops, orientation sessions, and induction programs to foster academic grit among biology undergraduates.

2. Incorporating grit and growth mindset interventions into biology courses can enhance the effectiveness of trainee biology teachers.

3. Activities to enhance biology students' concentration in the classroom and outside the classroom should be developed and implemented.

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