Online Self-Regulated Learning and University Students' Actual Grade Achievement:
The Mediating Effect of Grit During Online Classes

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Abstract
Online learning requires self-responsibility, self-regulation, autonomy, determination and passion among students for their academic achievement. Prime objective of present research was to explore the mediating effect of grit in relationship between online self-regulated learning and university students' actual grade achievement during online classes. Quantitative research paradigm with deductive method was employed in view of the nature of present research. A total of 238 university students, who attended online classes, participated in this study. Correlation, regression, simple mediation and parallel mediation statistical analyses were conducted to analyze the data. The results revealed significant positive relationship between online self-regulated learning, grit and actual grade achievement of university students. Furthermore, grit and its facets i.e. consistency of interest and perseverance of effort fully mediates the relationship of online self-regulated learning and actual grade achievement of university students. Perseverance of effort showed more predictive power for students' actual grade achievement than consistency of interest. Therefore, it is recommended that university faculty and administrators may focus on role of grit and self-regulated learning during online classes which in-turn will positively contribute towards academic success.
Keywords: Self-Regulated Learning, Online Classes, Grit, Parallel Mediation, Grade Achievement

Introduction

COVID-19 pandemic changed the scenario of educational learning spaces and online learning replaced traditional education system (Ma et al., 2022). In this difficult situation, digital technologies benefit all sectors including education. Higher educational institutions shifted their traditional education systems in online classes through various digital technologies. The digital technology has been benefiting educators, scholars and administrators to facilitate their work. Online learning environments offers sophisticated technological educational resources to learners for facilitating learning. Online learning has many benefits including flexible schedule, time convenience, learning of technical skills, self-pace learning, self-discipline, comfortable environment, responsibility and interaction (Muthuprasad et al., 2021). The concept of shared responsibility is essential component of online learning as online learning requires more responsibilities on behalf of students (Saint et al., 2022). In online classes, students are also responsible for their learning and success. Online learning system encourages autonomy and self-regulating behavior regarding learning among students. Self-regulated learning (SRL) influences success among students and it becomes more imperative in online learning (Ingkavara et al., 2022). In addition, researchers are agreed that SRL is important in modern online educational system (Saint et al., 2022) and also become essential in new normal.

Initially intelligence was considered as only factor of academic success. With progression of research in the field of motivation and learning, researchers unpacked that other factors are also responsible for learning success and self-regulation is one of them (Seli & Dembo, 2020). One of the imperative tasks of teachers is to make learners responsible and independent who can regulate themselves (Šteh & Šarić, 2020) and this can be done through making learners self-regulated (SR).

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SRL promotes autonomous learning where students take the responsibility of their learning (Zimmerman, 2008; Zimmerman & Kitsantas, 2014). SRL can be promoted by teaching students about cognitive method that helps in learning i.e. self-questioning and comprehension monitoring (Ormrod, Anderman, & Anderman, 2019). Multiple parts of brain are involved in SRL process that promotes concentration, attention, introspection, self-awareness, self-assessment, self-discipline, openness to change and self-learning (Nilson, 2013; Zimmerman, 2002). SRL has been contributing in the field of education through improving educational achievement of students (Zimmerman & Schunk, 2011). Self-regulated learners are more efficacious and successful in their professions (Wibrowski et al., 2017).

Academic self-regulation helps in accomplishment of various educational goals (Seli & Dembo, 2020). SRL also affects learning performance of students (Panadero et al., 2019; Wang, 2011). Students with high level of SRL skills have more chances of success in both traditional classrooms (Bellhäuser et al., 2016) and in online classes (Broadbent, 2017). These findings provided the background for research in area of SRL in online classes and helped in hypothesizing the positive interrelation of SRL and actual grade achievement of students. Research studies have identified the role of grit in various fields. It also has predictive power which helps people to retain in different domains of life i.e. educational institution, military, workplace and marital life (Eskreis-Winkler., 2014). Grit is a significant personal resource for the students of higher education. Gritty students also score higher marks in academia. The components of grit: consistency of interest (CI) and perseverance of effort (PE) also account for variance in academic achievement scores of students but PI brings more variance as compared to CI (Mason, 2018). Grit and academic success relation has been proved in various research studies (Bliss & Jacobson, 2020; Howard et al., 2019). These research findings further supported the present research to hypothesize the grit and academic achievement interrelationship.

As far as relationship of SRL and grit is concerned, grit predicts many of the facets of SRL. Above all, engagement of students in SRL serve as key path between grit and educational achievement. (Wolters & Hussain (2015). Grit and SRL both have significant role in educational process and have connection with educational success. Gritty students can set their goals, plan to accomplish them and focus on success. Educators are required to get familiarity with those factors which influence SRL (Wang, 2021). Furthermore, grit promotes determined self-regulation and aid students in accomplishment of their goals during various circumstances. Gritty people do effort for better performance and can control emotions (Eskreis-Winkler et al., 2014). Gritty students with self-regulated behavior involve more in situations which are demanding and challenging (Wolters & Hussain, 2015). Educational background is not an obstacle in learning SRL strategies. SRL advances strategic management and cognitive awareness of students which could result in academic success (Wang, 2021). Above findings supported in hypothesizing the relationship between grit and SRL in online classes.

Previous research findings confirmed the relationship among grit and actual grade achievement of students (Clark & Malecki, 2019; Credé et al., 2017; Duckworth et al., 2007); SRL and students' performance (Panadero et al., 2019) and grit and SRL (Wolters & Hussain (2015). Moreover, SRL and grit both relate to educational achievement or failure. Those students who recorded low in these constructs also scored low GPA (Martin et al., 2022). Moreover, well established theoretical association between grit, SRL and academic achievement of students has not been researched adequately (Martin et al., 2022) which makes the grounds for further research study. Therefore, present research explored the mediating role of Grit and parallel mediation of Grit facets: PE and CI in relationship with online self-regulated learning (OSRL) and students' actual grade achievement. Additionally, present research explored constructs of SRL, grit and actual grade achievement in online learning environment. Moreover, university students were taken as study participants as Colthorpe et al. (2019) mentioned that SRL is an essential skill required for university students as they work more independently to gain knowledge.

Research Problem Statement

New normal requires various strategies for making the learning successful. In traditional classroom settings, self-regulated learning and grit have proven the positive contribution in academic achievement of students. Online classes also require these two important constructs for achieving good grades. In this context, current research was planned to explore the mediating role of grit in

relationship between online self-regulated learning and university students actual grade achievement. As grit has two facets, therefore, parallel mediation analysis was used. Moreover, current research has also determined the relationship between of online self-regulated learning, grit and grade achievement of student. Present research further investigated the differences of online self-regulated learning and grit based on actual grade achievement of university students.

Research Significance

Present research is significant as now educational institutions, especially universities are moving towards the offering of online courses in new normal and this research may help them to consider important areas of self-regulated learning and grit which are key ingredients of success of students. Present research is significant as it is adding value to the present existing literature. University faculty may get benefit from the recommendations of current research to enhance the self-regulated behavior and grit among students so they can improve their grades in online learning environment. Moreover, various dimensions of online self-regulated learning have been mentioned in current research which may help students to identify the areas where they needs development. University administration and faculty may consider the results and recommendations of study while planning the online courses.

Literature Review

Present section reviewed the existing literature regarding online self-regulated learning, grit and actual grade achievement. Relationship, effects and impact of these three constructs was explored in the previous research work which guided the direction of present research.

Online Self-Regulated Learning and Grade Achievement

Success of students depends on intelligence but it is not the only factor which determines success. Students can learn through use of appropriate strategies by self-regulating (SR) their learning (Seli & Dembo, 2020). Self-regulation is required in six key areas which will be helpful in academic success: methods of learning, social environment, use of time, motivation, monitoring performance and physical environment (Seli & Dembo, 2020). Moreover, trainings of SRL enhances not only enhances performance of students but also improves motivation, cognitive strategies and self-efficacy of students (Theobald, 2021). SRL also works in online environment as Wong et al. (2019); Zheng (2016) identified that support of SRL enhances learning performance in online classes. There are strategies which enhance the SRL among students. Encourage students to set goals and follow the progress of these goals, give opportunity to work independently, assign small groups activities, teach time management skills and provide them facilitation of technology (Ormrod et al., 2019). Self-regulated learners exhibit high level of autonomy and responsibility. SRL is an exciting way of learning where learners focus on self-discovery (Zimmerman, 2002 cited in Wang, 2021). SRL not only work as predictor of academic success but also work as mediator between other variables such as collaboration and communication in online course and achievement (Barnard et al., 2008). Academic SRL can be categorized in the lifelong learning skill and may be taught to students at high school level as after that students are required to take important life decisions which impact future of students. Self-regulatory skills foster success in academic life as well as in future perspectives (DiBenedetto, 2018). Self-regulated learners regulate their motivation, context, behavior and cognition to achieve success. SRL is iterative, dynamic, motivated and metacognitive process that can be taught. Prompts helps in self-regulation (Zusho, 2017). The findings of these research studies helped in development of hypothesis regarding SRL and actual grade achievement. Although most of work has been done in traditional classroom settings but research studies also realized the importance of SRL studies in online classes.

H1: Online self-regulated learning contributes positively to university students' actual grade achievement.

Online Self-Regulated Learning and Grit

Grit contributed to academic success with SRL and both are also linked with each other. Both grits and SRL collectively act as predictors of academic accomplishments (Wolters & Hussain, 2015). Research studies also showed a connection between SRL and grit and has a theoretical connection with students' success in academic setting (Wang, 2021). Grit has been studied in various field including education. PE and CI are two facets of grit and have been studied in various research studies separately, collectively and one of them. Xu et al. (2021) studied only perseverance facet of grit for predicting success among students. The two facets of grit needed to be explored separately and there is also a need of more research studies to identify the configural relation between these two facets and

their relationship with success (Credé, 2018). PE explains the tendency of individual to work hard while CI is a tendency of individual to work consistently on interest and goals instead of frequently changing it (Duckworth & Quinn, 2009). In addition, when grit was studied with integration of SRL skills, it was found that those students who set long-term goals utilize SRL skill more (Almeida, 2016). Few research studies also studied the SRL/strategies as mediator (Wolters & Hussain, 2015; Xu et al., 2021). More work is required on the relationship of grit and SRL connection and their link with actual grade achievement. In addition to this, there is also a need to identify the mediating role of grit in relationship of SRL and actual grade achievement in context of line learning. Following hypotheses were formulated to dis/confirm the previous research findings and for setting the guidelines for future researchers.

H2: Relationship of online self-regulated learning with grit is positive among university students.

Grit and Actual Grade Achievement

Gritty individuals perform better in comparison to those who are less gritty. Study conducted on performance of teachers revealed that grit also contributed to performance of teachers. Gritty people work longer and harder in challenging circumstances (Duckworth et al., 2009). Construct of grit has been explored in various fields including work and education but still facets of grit passion and perseverance still need to be explored in educational context. Grit was not related with IQ but strong relationship was present with conscientiousness of personality. Moreover, grit predicts success strongly than conscientiousness and IQ (Duckworth et al., 2007). Grit as non-cognitive trait predicts the grades of college students among males. It is also effective at all levels of education (Strayhorn, 2014). Credé et al. (2017) did met analysis of 73 grit research work and disclosed that facets of grit matter in studies and should be considered these in while studying grit. PE is more predictive than CI of grit. Moreover, grit adds value in academic success, but results varied as in some studies grit contribution is small to none in predicting students' GPA. On the other side research studies also supported effect of grit on academic achievement of learners. Moreover, impact of grit varied across gender and PE facet of grit have more predictive value for success (Whipple & Dimitrova-Grajzl, 2021). Previous research studies guided the present research in hypothesizing the H3.

H3: Grit contributes positively to university students' actual grade achievement.

Most of research studies had engrossed on the overall impact of grit on success of students. Further, both facets of grit effects academic success proved by various research studies. Numerous research studies identified association among PE, academic success (in both standardized and non-standardized tests) and academic engagement. Though, link of CI and academic results were mostly not significant (Dixson et al., 2016; Rimfeld et al., 2016) and in some cases significantly negative (Datu et al., 2016). Furthermore, literature on adolescent also suggested that grit has implications for success among adult students. Moreover, it was proved in multi sample studies that PE was related positively with GPA of college students (Bowman et al., 2015). CI relation with GPA was contradictory as in some studies it was significant and in other studies it was insignificant. Clark et al. (2020) in their research study did not find any significant link between CI and GPA. On the other hand, additional studies are required to advance the links of PE with CI and success of students especially in adults (Clark et al., 2020). Based on the relationship defined in the previous research studies, present research hypothesized the interrelation between grit, OSRL and university students' actual grade achievement. Moreover, present research added the incremental value in existing literature as it considered the grit as moderator. Additionally, PE and CI were also taken as moderator between OSRL and university students' actual grade achievement.

H4: Grit work as mediator in relationship between online self-regulated learning and university students' actual grade achievement.

H4a: Perseverance of effort facet of Grit work as mediator in relationship between online self-regulated learning and university students' actual grade achievement.

H4b: Consistency of interest facet of Grit work as mediator in relationship between online self-regulated learning and university students' actual grade achievement.
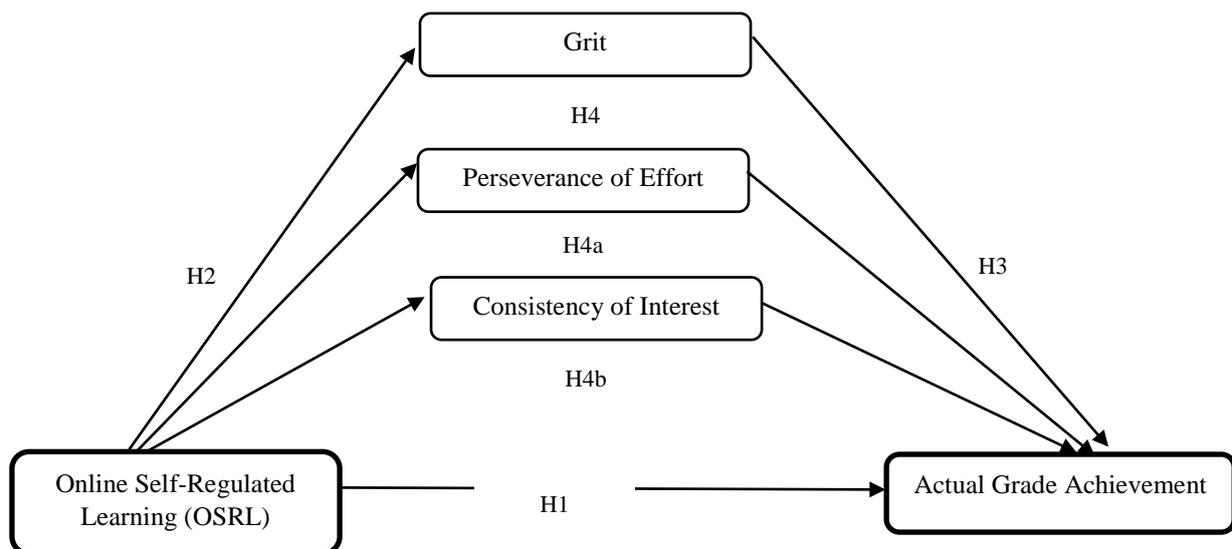
Figure 1. Research Framework Showing Mediation Paths

Methodology

Current study followed the quantitative research paradigm with deductive approach to test hypotheses of research. There were three variables of study: online self-regulated learning, grit and university students' actual grade achievement. University students comprised of the population of study as during COVID-19 universities continued their education through online modes of education.

Participants

In Pakistan, during COVID-19, university students were engaged in online classes. Therefore, university students were taken as sample of study. Students from two public universities were selected as participants. Those students were selected who were part of online learning process. Convenience sampling technique was used for collecting data. Google Form link of questionnaire was shared with students. Finally, 259 responses were received. After data screening, 238 filled responses were finalized for data analysis.

Research Instruments

Online Self-Regulated Learning Questionnaire (OSRLQ) was chosen to assess the self-regulation of university students during online classes. It was developed by Barnard, et al., 2009. It consisted of 6 dimensions with 24 questions items. Students were required to show their agreement and disagreement on 5-point scale. It covers the multiple perspectives of students 'self-regulating behavior in online classes. Cronbach's Alpha (α), ω, CR and AVE were calculated. The Online Self-Regulated Learning Questionnaire has α = .932, ω =.933, CR =0.973, AVE= 0.606. Cronbach's Alpha and ω reliability values of OSLQ were greater than 0.7 which exhibited good reliability. All values of CR were above 0.80 and AVE were 0.50 which comes under the acceptable range as CR >0.70 and AVE >0.50 is required for establishing the convergent validity of scale (Fornell & Larcker, 1981; Hair, et al., 2009).

Short grit scale with 8 items were used. It was developed by Duckworth and Quinn (2009). Reverse scoring of the required questions was also done. Results of α, ω, CR and AVE showed that Consistency of Interest has α =.732, ω =.733, CR=.831, AVE =.552 and Perseverance of Effort has α =.745, ω =.752, CR=.836, AVE=.563. Overall grit scale has α =.775, ω =.777, CR=0.909 and AVE=.557. All values were within the acceptable range.

Actual Grade Achievement of students was measured through their GPAs. Students' results were taken as criteria of performance as at university level results are based on multiple formative and summative assessment activities i.e., presentations, class participation, short assignment/s, long assignment/s, quizzes, projects, midterm papers and final papers. Five subcategories were made based on criteria used for grading university students.

Data Collection and Analysis

Data was collected from the students of two public universities through Google Form link. For analyzing the data, software of SPSS and Process Macro were used. Various statistical techniques

were applied including regression and parallel/mediation analysis to test hypotheses of present research.

Table 1

Descriptive Statistics regarding OSRL, Grit and Actual Grade Achievement

Research Variables	Mean	SD.	Skewness		Kurtosis	
			Statistic	SE	Statistic	SE
1 Online Self-Regulated Learning	3.81	.484	.118	.158	.028	.314
2 Grit.	3.77	.574	.322	.158	-.379	.314
3 Perseverance of Effort (PE)	3.88	.662	-.206	.158	-.286	.314
4 Consistency of Interest (CI)	3.65	.714	-.033	.158	.274	.314
5 Actual Grade Achievement	3.79	.996	-.482	.158	-.357	.314

Results of table 1 regarding mean value depicted that students have higher level of self-regulating behavior of learning (M=3.81), Girt (M=3.77) and actual grade achievement. PE (M=3.8) level was higher than CI level (M=3.65). Skewness and Kurtosis statistics were also calculated. There values were found within the acceptable range as ±2 is the acceptable limit (George & Mallery, 2010).

Table 2

Correlation among OSRL, Grit and university Students' Actual Grade Achievement

		1	2	3	4	5
1	Online Self-Regulated Learning (OSRL)	1	.627**	.462**	.579**	.341**
2	Grit.		1	.820**	.847**	.493**
3	Perseverance of Effort (PE)			1	.390**	.469**
4	Consistency of Interest (CI)				1	.357**
5	Actual Grade Achievement					1

*Note. **p<.01*

Results of table 2 displayed that significant positive correlation exists between OSRL, and grit r=.627**, p< .01. OSRL was correlated positively with university students' actual grade achievement r=.341**, p< .01. Moreover, Grit was correlated positively with actual grade achievement r=.493**, p< .01. Sub-dimensions of grit: PE and CI also have positive association with OSRL and university students' actual grade achievement. These findings show that grit has higher relationship with students' actual grade achievement as compared to OSRL. Although OSRL and grit both have positive relationship with students' actual grade achievement but propensity of relationship is weak since r< 0.5.

Table 3

ANOVA in OSRL and Grit based on University Students' Actual Grade Achievement

Measure	Actual Grade Achievement (GPAs)					F	η^2
	1.00-1.99	2.00-2.99	3.00-3.49	3.50-3.99	4.00		
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)		
OSRL	2.86 (.527)	3.48 (.317)	3.71 (.426)	3.89 (.499)	3.94 (.442)	9.77**	.143
Grit	2.84 (.312)	3.23 (.445)	3.56 (.448)	3.84 (.537)	4.09 (.531)	18.8**	.244

*Note. **p<.01*

Results (Table 3) depict that those students who have low level of actual grade achievement they also have low level of OSRL (1.00-1.99 M=2.86) and grit (1.00-1.99 M=2.84). Additionally, students whose actual grade achievements are higher they also have higher level of OSRL (3.50-3.99 M=3.89 and 4.00 M=3.94) and grit (3.50-3.99M=3.84 and 4.00 M=4.09). Results display that OSRL and grit both contribute to enhancing university students' actual grade achievement. Total 0.143% variance in university students' actual grade achievement is accounted by OSRL and 0.224% variance in university students' actual grade achievement is accounted by grit.

Table 4

Results of linear Regression

Variables Directions	β	SE	R^2	t	Sig.	Results
H1: OSRL→ AGA	.702	.126	.116	5.577	.000	H1: Supported
H2: OSRL →GRIT	.743	.060	.393	12.35	.000	H2: Supported
H3: GRIT→AGA	.854	.098	.243	8.695	.000	H3: Supported

Results (table 4) indicate that online self-regulated learning (OSRL) significantly effects the university students' academic performance β=.702, t=5.57, p< .001 and grit β=.743, t=2.35, p< .001. Online self-regulated learning brings 11.6% variation in actual grade achievement and 39.3%

variation in grit. Grit among students also significantly effects their actual grade achievement β=.854, t=8.69, p< .001 and brings 24.3% variation in university students' actual grade achievement.

Table 5

Mediating Role of Grit in Relationship of Online Self-regulated Learning and University Students' Actual Grade Achievement

	Effects	SE	t	p	LLCI	ULCI
OSRL→ AGA	.110	.149	.736	>.05	-.1847	.4050
OSRL →GRIT	.743	.060	12.35	<.001	.624	.861
OSRL→ GRIT→AGA	.795	.126	6.30	<.001	.5473	1.0445
Effects						
Total	.701	.125	5.57	<.001	.4538	.9496
Direct	.110	.149	.736	>.05	-.1847	.4050
Indirect*	.591	.095			.4062	.7859
Sobel test	Effects	SE	Z	p		
	.591	0.089	7.126	0.000		

SPSS Process Macro was used to perform the mediation analysis. Results (table 5) indicated that OSRL significantly predicted the girt b=.743, p< .001. Whereas OSRL didn't significantly predict academic performance while controlling the effect of grit b=.110, p >.05. There was significant positive indirect effect of online self-regulated learning was found on university students' actual grade achievement through mediator grit a*b =.591. Therefore, mediator grit explained 84% effect on actual grade achievement [PM = (.591) / (.701)]. Additionally, direct effect of online self-regulated learning on actual grade achievement was not significant b=.110, p >.05. Sobel test values also confirmed the full mediation Z=7.126, p< .001.
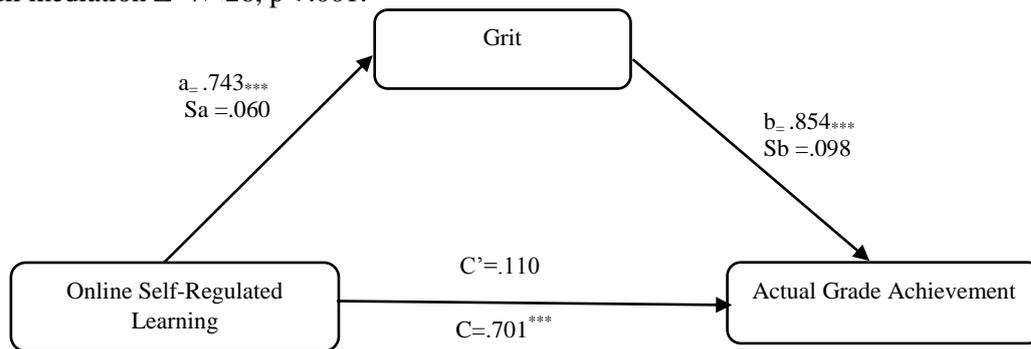
Figure 2. Results of Simple Mediation Analysis Showing Grit as Mediator

Table 6

Parallel Mediation Analysis Results

	Effects	SE	t	p	LLCI	ULCI
OSRL →PE	.632	.079	7.99	<.001	.4764	.7878
OSRL →CI	.854	.078	10.9	<.001	.7002	1.0086
PE →AGA	.554	.096	5.73	<.001	.3640	.7452
CI →AGA	.238	.097	2.44	<.01	.0463	.4312
Effects						
Direct Effect	.147	.149	.984	>.05	-.1475	.4418
Indirect Effects						
OSRL →PE→AGA	.350	.075			.2110	.5056
OSRL →CI→AGA	.204	.096			.0103	.3916
OSRL →PE,CI→AGA	.554	.100			.3660	.7544

*Note. *p<.05*

Results (Table 6) indicate that OSRL significantly predict perseverance of effort (PE) b=.632, p< .001and consistency of interest (CI) b=.854, p< .001. Furthermore, PE (b=.554, p< .001) and CI (b=.238, p< .001) also significantly predict AGA. Direct effect of OSRL on actual grade achievement is not significant in the presence of mediators PE and CI b=.147, p>.05. The significant positive

mediating effect of PE (Effect=.350, p< .001) and CI (Effect=.204, p< .001) on OSRL-AGA was found. Total indirect effect of PE and CI was also significant (Effect=.554, p< .001).
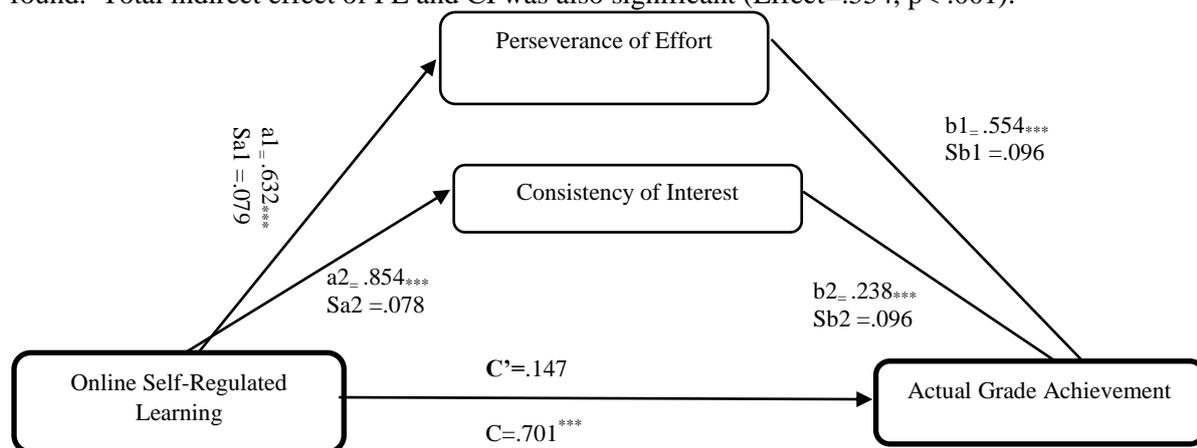

Figure 3. Parallel Mediation Results

Findings of Research Study

Following are the findings of research study:

- A significant and positive relationship was found between OSRL, girt and university students' actual grade achievement.
- Level of online self-regulated learning (OSRL) and grit was significantly different among students having various grade achievements. Students with higher grades were having higher level of online self-regulated learning & grit and vise versa.
- A significant effect of online self-regulated learning was found on girt and actual grade achievement of university students. Moreover, significant effect of grit was also found on actual grade achievement of university students.
- Git and its facets: perseverance of effort and consistency of interest fully mediates the relationship of OSRL and actual grade achievement of university students.

Discussion and Conclusion

Self-regulating learning behavior of students becomes more significant in online classes for gaining academic success. Numerous research studies have been carried out to explore this relationship. Grit was found another factor contributing towards this. Present study was perpetrated to explore the relationship between OSRL, grit and academic grade achievement. Added to this, mediating role of grit in relationship of OSRL and university students' academic grade achievement was explored. Another significant facet of research was to find out parallel mediating effect of grit dimensions PE and CI.

Present study found that those students who have low level of actual grade achievement they also have low level of OSRL and grit and vice versa. Results show that OSRL and grit both contribute to enhancing university students' actual grade achievement. Results of study conducted by Martin et al. (2022) favored the findings of present research. They conducted research on engineering students and explored that grit and SRL is higher in students with high GPA. Additionally, they also explored that both are source of increase in GPA of students. Present research is also relevant in the context of Pakistan as this has explored that factors of OSRL and Grit have contribution value in enhancement of grade achievement of students.

Present research study results indicate that OSRL contribute positively to university students' actual grade achievement (H1). Park et al. (2022) conducted research on nursing college and results of study are consistent with present research that SRL explained variance in students' academic achievement. Rivers et al. (2022) conducted study in Japanese university and test the primary thesis that SRL impacts the performance of students and explored limited effect size on achievement. Riaz et al. (2022) research study results are consistent with current research that SRL effects the academic score and also suggested that curriculum makers may add such activities in curriculum which are helpful in development of self-regulated learning habits. Research study of Ali and Hanna (2022) also confirmed the results of present research that self-regulated learning (SRL) relationship with students'

achievement. They further explained that students with high SRL achieved high grades in hybrid classrooms.

Present research further explored that relationship of OSRL with grit is positive among university students (H2). Although majority of research studies confirmed the results of present research but results of Wolters and Hussain (2015) research are at some extent contradict with present study. They indicated in their study that perseverance of effort (PE) was predictor of SRL while consistency of interest (CI) was partly related with SRL. PE predicted students' achievement while CI exhibited no link with achievement.

Current research study results indicated that grit effect on university students' actual grade achievement is significantly positive (H3). Clark et al. (2020) results are consistent with present research study that grit and success are positively associated with each other. Lim et al (2021) research study results strengthen the present research study results as they come up with conclusion that higher grit level is a source of enhancing the SRL, academic adjustment and career adaptability. It also helps student to adjust in the non-traditional institutes.

Results of present research depict that grit work as mediator in relationship between OSRL and university students' actual grade achievement (H4). Additional significant aspect of present research was to find out the parallel mediating effect of dimensions of Grit: PE and CI on OSRL and university students' actual grade achievement. Results confirmed this parallel mediation. The research findings of Wolters and Hussain (2015) are congruent with present research as PE facet of Grit was higher among students than CI facet of grit. Moreover, PE strongly predicted actual grade achievement in comparison of CI. Credé et al. (2017) in their research study said that PE facet is a stronger criterion of performance than CI facet which is consistent with present research study. Alhadabi and Karpinski (2020) study results are in accordance with present research that PE and CI facets of grit are associated positively with academic accomplishment.

Previous researches considered these variables separately and collectively showing various directions between these variables but present research add novelty and value in literature as it studied the mediation and parallel mediation effect of grits and its facets of PE and CI in relationship of OSRL and university students' actual grade achievement.

Recommendations and Future Directions

Mediating role of Grit and its aspects in relationship of OSRL and actual grade achievement will contribute to literature and provide way forward for the future researchers and university teaching community. Present research was conducted in universities of Pakistan, this will also help the researchers to understand constructs from various cultural contexts. Xu et al. (2021) identified in their study that cultural variations exist in context of results of PE facets of Grit and SRL. In conversation of Perkins-Gough (2013) with Duckworth, she explains that students can develop grit and it is interrelated with achievement. Grit is malleable and can be improved with interventions (Clark & Malecki, 2019). As grit can be developed among students, therefore, university faculty may help students in developing grit in online learning. Teachers may identify the less gritty students and help them to develop grit which in turn will help them to improve their academic performance.

Bashant (2014) research study argued that quality of strategies and interventions are helpful for developing grit. Schools play an important role in this respect. Teachers may help students to set and attain goals is an important step to make them gritty. Results of present research provided insight to university students that OSRL and grit are important facets of students' actual grade achievement in online learning. Faculty may develop SRL as Russell et al (2022) discussed that engagement of teachers in self-regulation promotes students' capacities of self-regulation. Teachers may use various educational activities and class assignments to self-regulate students' learning which include emotions, cognitive processes, behavior, environment and motivations (Nilsson, 2013). Additionally, training programs regarding SRL may help students to develop SRL as Theobald (2021) discussed that training programs regarding self-regulated learning increased the university students' academic performance. Teachers may give weightage to OSRL and grit during online classes with other elements of teaching and learning as these are criterions of university students' actual grade achievement. Further research studies are required in various cultures, age groups and levels of education which will help to dis/confirm the mediating relationship between constructs. University faculty and administrators may focus on role of grit and self-regulated learning during online classes which in turn will positively contribute to academic success.

References

Alhadabi, A., & Karpinski, A. C. (2020). Grit, self-efficacy, achievement orientation goals, and academic performance in university students. *International Journal of Adolescence and Youth*, 25(1), 519-535.

Ali, A. D., & Hanna, W. K. (2022). Predicting students' achievement in a hybrid environment through self-regulated learning, log data, and course engagement: A data mining approach. *Journal of Educational Computing Research*, 60(4), 960-985.

Almeida, D. J. (2016). Understanding grit in the context of higher education. *In Higher education: Handbook of theory and research* (pp. 559-609). Springer, Cham.

Barnard, L., Lan, W. Y., To, Y. M., Paton, V. O., & Lai, S. L. (2009). Measuring self-regulation in online and blended learning environments. *The internet and higher education*, 12(1), 1-6.

Barnard, L., Paton, V., & Lan, W. (2008). Online self-regulatory learning behaviors as a mediator in the relationship between online course perceptions with achievement. *International Review of Research in Open and Distributed Learning*, 9(2), 1-11.

Bashant, J. (2014). Developing grit in our students: Why grit is such a desirable trait, and practical strategies for teachers and schools. *Journal for Leadership and Instruction*, 13(2), 14-17.

Bellhäuser, H., Lösch, T., Winter, C., & Schmitz, B. (2016). Applying a web-based training to foster self-regulated learning—Effects of an intervention for large numbers of participants. *The Internet and Higher Education*, 31, 87-100.

Bliss, R., & Jacobson, E. (2020). Doctor of physical therapy student grit as a predictor of academic success: a pilot study. *Health Professions Education*, 6(4), 522-528.

Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on truckin'or stay the course? Exploring grit dimensions as differential predictors of educational achievement, satisfaction, and intentions. *Social Psychological and Personality Science*, 6(6), 639-645.

Broadbent, J. (2017). Comparing online and blended learner's self-regulated learning strategies and academic performance. *The Internet and Higher Education*, 33, 24-32.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, 27, 1-13.

Broadbent, J., Sharman, S., Panadero, E., & Fuller-Tyszkiewicz, M. (2021). How does self-regulated learning influence formative assessment and summative grade? Comparing online and blended learners. *The Internet and Higher Education,* 50, 100805.

Clark, K. N., & Malecki, C. K. (2019). Academic Grit Scale: Psychometric properties and associations with achievement and life satisfaction. *Journal of school psychology*, 72, 49-66.

Clark, K. N., Dorio, N. B., Eldridge, M. A., Malecki, C. K., & Demaray, M. K. (2020). Adolescent academic achievement: A model of social support and grit. *Psychology in the Schools*, 57(2), 204-221.

Colthorpe, K., Ogiji, J., Ainscough, L., Zimbardi, K., & Anderson, S. (2019). Effect of metacognitive prompts on undergraduate pharmacy students' self-regulated learning behavior. *American journal of pharmaceutical education*, 83(4).

Credé, M. (2018). What shall we do about grit? A critical review of what we know and what we don't know. *Educational Researcher*, 47(9), 606-611.

Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, 113(3), 492–511.

Datu, J. A. D., Valdez, J. P. M., & King, R. B. (2016). Perseverance counts but consistency does not! Validating the short grit scale in a collectivist setting. *Current Psychology*, 35, 121–130.

DiBenedetto, M. K. (Ed.). (2018). *Connecting self-regulated learning and performance with instruction across high school content areas*. Springer.

Dixson, D. D., Worrell, F. C., Olszewski-Kubilius, P., & Subotnik, R. F. (2016). Beyond perceived ability: The contribution of psychosocial factors to academic performance. *Annals of the New York Academy of Sciences*, 1377(1), 67-77.

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment*, 91(2), 166–174.

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: perseverance and passion for long-term goals. *Journal of personality and social psychology*, 92(6), 1087.

Duckworth, A. L., Quinn, P. D., & Seligman, M. E. (2009). Positive predictors of teacher effectiveness. The *Journal of Positive Psychology*, 4(6), 540-547.

Eskreis-Winkler, L., Shulman, E. P., Beal, S. A., & Duckworth, A. L. (2014). The grit effect: Predicting retention in the military, the workplace, school and marriage. *Frontiers in Psychology*, 5(36), 1–12.

Fornell, C., & Larcker, D. F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research*, 382-388.

George, D., & Mallery, M. (2010*). SPSS for Windows Step by Step: A Simple Guide and Reference*, 17.0 update (10a ed.) Boston: Pearson.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2009). *Multivariate Data Analysis* (7th ed.). Upper Saddle River, New Jersey: Pearson Education Limited.

Howard, J. M., Nicholson, B. C., & Chesnut, S. R. (2019). Relationships between positive parenting, overparenting, grit, and academic success. *Journal of College Student Development*, 60(2), 189-202.

Ingkavara, T., Panjaburee, P., Srisawasdi, N., & Sajjapanroj, S. (2022). The use of a personalized learning approach to implementing self-regulated online learning. Computers and Education: *Artificial Intelligence*, 3, 100086.

Lim, H. J., Hwang, M. H., & Ha, H. (2021). The Relationship of Grit, Career Adaptability, Self-Regulated Learning, and Academic Adjustment: Focusing on the Multiple Mediational Effects. *Hong Kong Journal of Social Sciences*. Vol. 57, 184-195

Ma, M., Li, M., Wang, Q., Qiu, A., & Wang, T. (2022). Online self-regulated learning and academic procrastination: A moderated mediation model. *Psychology in the Schools*, 59, 1856–1872

Martin, H., Craigwell, R., & Ramjarrie, K. (2022). Grit, motivational belief, self-regulated learning (SRL), and academic achievement of civil engineering students. *European Journal of Engineering Education*, 47(4), 535-557.

Mason, H. D. (2018). Grit and academic performance among first-year university students: A brief report. *Journal of Psychology in Africa*, 28(1), 66-68.

Muthuprasad, T., Aiswarya, S., Aditya, K. S., & Jha, G. K. (2021). Students' perception and preference for online education in India during COVID-19 pandemic. *Social Sciences & Humanities Open*, 3(1), 100101.

Nilson, L. B. (2013). *Creating self-regulated learners: Strategies to strengthen students' self-awareness and learning skills*. Stylus Publishing, LLC.

Ormrod, J. E., Anderman, E. M., & Anderman, L. H. (2019). *Educational psychology: Developing learners*. (10th ed).Hoboken, NJ : Pearson.

Panadero, E., Broadbent, J., Boud, D., & Lodge, J. M. (2019). Using formative assessment to influence self-and co-regulated learning: the role of evaluative judgement. *European Journal of Psychology of Education*, 34(3), 535-557.

Park, K., Moon, S., & Oh, J. (2022). Predictors of academic achievement in distance learning for nursing students. *Nurse Education Today*, 108, 105162.

Perkins-Gough, D. (2013). The significance of grit: A conversation with Angela Lee Duckworth. *Educational Leadership*, 71(1), 14-20.

Riaz, H., Shah, S. A., & Tariq, A. A. (2022). Impact of Academic Self-concept and Self-regulated Learning on Academic Achievement of Students. *Research Journal of Social Sciences and Economics Review*, 2(2), 18-26.

Rimfeld, K., Kovas, Y., Dale, P. S., & Plomin, R. (2016). True grit and genetics: Predicting academic achievement from personality. *Journal of personality and social psychology*, 111(5), 780.

Rivers, D. J., Nakamura, M., & Vallance, M. (2022). Online self-regulated learning and achievement in the era of change. *Journal of Educational Computing Research*, 60(1), 104-131.

Russell, J. M., Baik, C., Ryan, A. T., & Molloy, E. (2022). Fostering self-regulated learning in higher education: Making self-regulation visible. *Active Learning in Higher Education*, 23(2), 97-113.

Saint, J., Fan, Y., Gašević, D., & Pardo, A. (2022). Temporally-focused analytics of self-regulated learning: A systematic review of literature. Computers and Education: *Artificial Intelligence*, 100060.

Seli, H. & Dembo, M. H., (2020). *Motivation and learning strategies for college success: A focus on self-regulated learning.* (6 th ed.). Routledge.

Šteh, B., and Šarić, M. (2020). Enhancing self-regulated learning in higher education. *J.Elementary Educ*. 13, 129–150.

Strayhorn, T. L. (2014). What role does grit play in the academic success of black male collegians at predominantly white institutions?. *Journal of African American Studies*, 18(1), 1-10.

Theobald, M. (2021). Self-regulated learning training programs enhance university students' academic performance, self-regulated learning strategies, and motivation: A meta-analysis. *Contemporary Educational Psychology*, 66, 101976.

Wang, L. (2021). The role of students' self-regulated learning, grit, and resilience in second language learning. *Frontiers in Psychology*, 12. 800488.

Wang, T. H. (2011). Developing Web-based assessment strategies for facilitating junior high school students to perform self-regulated learning in an e-Learning environment. *Computers & Education*, 57(2), 1801-1812.

Whipple, S. S., & Dimitrova-Grajzl, V. (2021). Grit, fit, gender, and academic achievement among first-year college students. *Psychology in the Schools*, 58(2), 332-350.

Wibrowski, C. R., Matthews, W. K., and Kitsantas, A. (2017). The role of a skills learning support program on first-generation college students' self-regulation, motivation, and academic achievement: A longitudinal study. J. College Stud. Retention: *Res. Theory Pract*. 19, 317–332.

Wolters, C. A., & Hussain, M. (2015). Investigating grit and its relations with college students' self-regulated learning and academic achievement. *Metacognition and Learning*, 10(3), 293-311.

Wong, J., Baars, M., Davis, D., Van Der Zee, T., Houben, G. J., & Paas, F. (2019). Supporting self-regulated learning in online learning environments and MOOCs: A systematic review. *International Journal of Human–Computer Interaction*, 35(4-5), 356-373.

Xu, K. M., Cunha-Harvey, A. R., King, R. B., de Koning, B. B., Paas, F., Baars, M.., & De Groot, R. (2021). A cross-cultural investigation on perseverance, self-regulated learning, motivation, and achievement. Compare: *A Journal of Comparative and International Education*, 1-19.

Zheng, L. (2016). The effectiveness of self-regulated learning scaffolds on academic performance in computer-based learning environments: A meta-analysis. *Asia Pacific Education Review*, 17(2), 187-202.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, 41(2), 64-70.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American educational research journal*, 45(1), 166-183.

Zimmerman, B. J., & Kitsantas, A. (2014). Comparing students' self-discipline and self-regulation measures and their prediction of academic achievement. *Contemporary educational psychology*, 39(2), 145-155.

Zimmerman, B. J., and Schunk, D. H. (2011). "Self-regulated learning and performance. An introduction and an overview," *in Handbook of Self-Regulation of Learning and Performance* (New York, NY: Routledge), 1–12.

Zusho, A. (2017). Toward an integrated model of student learning in the college classroom. *Educ. Psychol. Rev*. 29, 301–324.