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THE INTERPLAY OF TIME CONSTRAINTS, ACADEMIC PROFICIENCY, AND ABERRANT RESPONSE PATTERNS IN MATHEMATICS ASSESSMENT

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Abstract

A test response that behaves abnormally is one that deviates from an expected pattern based on the student's actual ability. Time pressure can cause students' aberrant behavior and obscure their true abilities, whether conditioned or unconditioned. This study examined the nexus between time pressure and mathematical ability in the spectrum of within-ability (W*) and beyond-ability (B*) responses. In this study, a factorial design of 2x2x2 was used. Five hundred and fifty grade 11 students from a high school in south-western Nigeria were surveyed. The data was analyzed based on ability measures (low vs high) and time pressure (conditioned vs unconditioned) as the independent variables, while aberrance responses measured as B* and W* were the dependent variables. Using MANOVA, inferential statistics were generated to determine the participants' ability and time pressure differences regarding their aberrance behavior. According to the results, low-ability examinees showed more response aberration than high-ability examinees, as measured by W* and B*. Additionally, the analyses show that students with unconditioned time pressure respond more than those with conditioned time pressure, and the interaction between ability and time pressure was statistically significant ($F(1,546) = 19.566$, $P = 0.001$). Based on the findings, it is evident that time pressure inhibits mathematical ability and might lead to response aberrations. This study provides direction for future research on aberrance responses.

1. Introduction

Response patterns provide test designers and examiners feedback on whether the test has achieved its purpose, measuring students' ability or otherwise. According to Chen (2005), a response pattern is used to provide detailed information about an examinee's performance in a test and determine the help the examinee received during the test and whether the total test score adequately measures the examinee's ability level. Response patterns include solution, rapid guessing, and aberrant behavior (Zhang *et al*., 2022). The aberrant response occurs when students' responses in a test defy the expected response patterns by the test designers. Aberrance in test response is further explained as the responses which occur when the pattern of a student's response is not consistent with the level of knowledge they demonstrated for other questions on the exam (Adediwura & Agunbiade, 2015). Hence, aberrance in students' responses is a pattern of students answering questions deemed difficult but failing to answer the easy questions correctly. Chen (2005) further explained that aberrance in test response is simply a form of deviation from an expected pattern in the test. This is exemplified by a situation where a test-taker misses many easy items but correctly answers many difficult items. Aberrance could fall either within the ability of an examinee referred to as "Within Ability Aberrance," W* or beyond the ability of the examinee referred to as "Beyond Ability Aberrance", B*. Within ability, aberrance is when an examinee responds wrongly to easy items, while beyond ability, aberrance is when the examinee responds correctly to difficult items (Adediwura & Agunbiade, 2015). Therefore, aberrance generally refers to a deviation in the expected patterns of examinees' responses. Factors responsible for aberrant response patterns include guessing, sleeping, extreme creativity, alignment errors, cheating, plodding, and deficiency or low ability (Ayanwale, 2022; Jia *et al*., 2019). Other factors recognized are due to ambiguous instructions, bad test items, answer coping, special accommodated examines, and speediness of the test (Wang & Kuncel, 2018). While the first category of aberrant-causing factors is traced to the students, the second group of factors is traced to the item items or test designers. As a result of this, test items must be studied to understand the pattern of aberrant exhibited by the examinees as well as the possible causes of the aberrant behavior. As aberrant behavior deviates from the expected outcomes and flaws, interpreting an examinee's ability and defining a level of expectation or correct response to pass a sound judgment on the aberrance level becomes a challenge. However, research has proposed several ways of tackling this challenge through a person-fit statistic. According to Petridou and Williams (2007); Ayanwale (2022), aberrance response is signaled by a high person-fit statistic. The person-fit statistic presents a standard for measuring aberrance response based on a normative model computed from the correct predictions of the test and the deviations of observed responses (Petridou & Williams, 2007). Just as tests are mainly conducted to measure an examinee's intelligence and ability, aberrant behavior has also been predominantly investigated, considering achievement and ability measurement (Meijer & Sijtsma, 1995). Despite the intervention of person-fit statistics, the impact of examinees' ability in a given test cannot be overemphasized (Ayanwale, 2019; Adediwura & Agunbiade, 2015). Academic ability is one of the possible reasons for the existence of aberrant response patterns among examinees (Petridou & Williams, 2007). Others include demographic variations such as gender, language difficulties, ethnicity, motivation, anxiety, and strategies adopted in tests such as cheating, guessing, or plodding. According to Chen (2005), aberrant response patterns is responsible for producing specious low or high scores which fail to accurately reflect the actual ability of the examinee. Through responses to test items, it is expected that examinees' knowledge, skills level, and individual characteristics can be reflected (Doval & Delicado, 2020). Hence, respondents' answers to tests are expected to indicate their academic ability. Determining response aberrance in test items in core subjects like mathematics has been the goal of many researchers such as (Ayanwale, 2020; Adediwura and Agunbiade, 2015). To improve the usability, reliability, and validity of test scores, they surveyed a sample of 300 students from 10 local governments in Osun State secondary schools, while 20 students were purposively selected from each of the schools based on their ability in mathematics. The within ability aberrance was indicated with W* and beyond ability B*. With a measure of analysis of variance (ANOVA) and Scheffe Multiple Comparison, there was an aberrance in students' academic ability with a measure that is more than 0.5 in significance for the two aberrance indices, thus confirming the importance of mathematical ability on students' aberrance response patterns. Similarly, Petridou and Williams (2007) examined classroom interactions' contribution to aberrant behavior and students' ability. Petridou and Williams' (2007) study came at a time when there was no real data to measure factors like language, motivation, and student ability. While the survey carried out by the likes of Adediwura and Agunbiade (2015) attempted to fill this gap, the influence of the classroom on students' ability and, in general, the aberrance response can yet not be overemphasized. Petridou and Williams (2007) examined accessible person-level factors like ability, gender, anxiety, and motivation on class-level variables in mathematics. Thus, rather than single out individual mathematics ability, they examined the class-level mathematical ability and aberrance in test response. Despite the clustering of examinees into the class level, their findings show that class-level influences students' aberrance in mathematics; hence, rather than focusing on the variables mentioned above at the individual level alone, the class level must be considered in determining aberrance. More importantly, among the variables is academic ability. Petridou and Williams (2007) asserted that academic ability in mathematics has a far more significant impact on the aberrant response at individual and class levels. This also reinforces the findings of Adediwura and Agunbiade (2015), who show that academic ability in mathematics is one of the most significant determinants of aberrant responses. A single test score might be insufficient to measure aberrance on a test score properly. This is due to unknown factors such as strategies used by individual examinees when responding (Ayanwale et al., 2022; Meijer & Sijtsma, 1995). While this also depends on the academic ability of the examinees, the application of person-fit analysis can, however provide an insight into examinees' aberrance patterns (Meijer & Sijtsma, 1995). While the position of scholars like Petridou and Williams (2007), Adediwura and Agunbiade (2015) emphasized the importance of academic ability in determining aberrant response in mathematics, other factors such as time pressure and mathematical anxiety however moderates examinees' mathematical ability. A study by Ayanwale et al. (2018), and Skagerlund *et al*. (2019) on mathematics ability and anxiety examined the interference of anxiety in the working memory processes, which thus determine the performance of test-takers. In summary of their results, they concluded that test-takers with mathematical anxiety areinflicted with negative emotions that prompt cognitive responses, which often drain their working memory and negatively iinfluence. Time pressure has been established as an important factor in moderating mathematical anxiety with patterns of aberrant behavior in mathematical tests (Chen, 2005). While anxiety influences working memory, time pressure may advance the effects of anxiety on test performance. Time pressure, a component of test anxiety, is seen as a compressing force that can exert psychological influence and affect thinking patterns (Ayanwale et al., 2019; Orfus, 2008). Time pressure is especially significant in increasing students' anxiety and reducing accuracy when responding to tests (Fulton, 2016). Thus, some students resort to rapid guessing as the time limit is about to lapse. It is also established that students have more chances to get a question correctly when more time is spent on a question (Fulton, 2016). Hence, time pressure enhances aberrance behavior in test response. In Sussman (2021), time pressure, measured as a form of test anxiety, is found to influence students' distress and cognitive inhibition which negatively task performance resulting in aberrance response. Fulton's (2016) study in a suburban school district in New York shows the influence of anxiety-inducing factors such as races, gender, ages and learning ability. Time pressure is recognized as an immediate anxiety-inducing agent resulting in aberrance behavior. With Orfus (2008) reinforcing the negative influence of time pressure on students' ability, time pressure is thus linked to students' ability and aberrance behavior in test response. Ayanwale (2021), Petridou and Williams (2007) and Adediwura and Agunbiade (2015) found out that mathematical ability influences aberrant response, while Chen (2005) and Skagerlund *et al*. (2019) established the influence of time pressure on mathematical ability and consequently on aberrant behaviour. While there are numerous studies on aberrant response in mathematics (Ayanwale & Adeleke, 2020; Gökçe & Aydoğan, 2020; Marianti *et al*., 2014; Skagerlund *et al*., 2019), there is a dearth of literature on the combined variables of time pressure and mathematical ability on aberrant response in mathematics (Chen, 2005). This study is a further empirical literature on the variables of response aberrance, time pressure, and mathematical ability. Most importantly, this study has contributed to filling the gaps on aberrant response in Nigeria's government-owned secondary schools. Consequently, the objectives of this study is to find whether there is no significant main effect of student academic ability on response aberrance as measured by W* and B*, there is no significant main effect of time pressure on response aberrance as measured by W* and B*, and there is no significant interaction effect of academic ability and time pressure on response aberrance as measured by W* and B*.

2. Methodology

2.1 Research design

The research design and paradigm employed in this study aimed to thoroughly investigate aberrant behavior in high school students' mathematical achievement tests, with a particular focus on the influence of academic ability and time pressure. The study adopted a cross-sectional survey design, allowing for the collection of data at a single point in time from multiple participants. This design facilitated the examination of potential associations and patterns of behavior within a specific context.The research paradigm aligned with a quantitative approach, emphasizing the systematic collection and analysis of numerical data. This approach enabled the study to quantitatively measure aberrant behavior, academic ability, and the impact of time pressure on students' performance. By employing standardized tests, statistical analyses, and person-fit methods, the study aimed to derive objective and numerical insights into the relationships under investigation.

2.2 Participants

The sample for the study consisted of ten high schools selected from one of the three senatorial districts in Ondo State. This deliberate selection allowed for a diverse representation of the high school student population within the chosen region. A total of 575 students (57.7% males and 44.3% females) from grade 11 were sampled during the 2021/2022 academic year, whose mean age was 14.6 years. More importantly, all students participating in this study were taught primarily English during their academic journeys. Consequently, participants were expected to have good literacy and mathematics skills.

2.3 Measures

The instrument was adapted from the unified grade 11 examination questions in Ondo State. It is believed that the Examination Department of the Ondo State Ministry of Education validated and standardised the questions. As a result, the test items were already valid and reliable. Students' mathematics skills are assessed using this instrument. The mathematics achievement test consists of 50 multiple-choice items with five alternatives (A-E). The optical mark recorder sheets scored students' responses in two ways: either correctly, which is coded as 1, or incorrectly, which is coded as 0. The total score was calculated to determine the student's ability. There were 50 possible scores. The low scores on the test (1-24) indicate that the participants had low abilities, whereas high scores on the scale (25-50) indicate high abilities.Time pressure is also used in this study. We introduced the students to the test under two different time constraints within two weeks: one with a strict time limit (i.e., timed condition) and one with a relaxed time limit (i.e., untimed condition). To collect data on response patterns, instruments were administered to the students in both conditions with the help of a research assistant, specifically a mathematics teacher.

2.4 Validity and reliability of the instrument

The research instrument used for data collection in this study was adapted. Thus, there is a need to validate the instrument and ensure its validity and reliability. The researcher ensured the instrument's content validity by having it carefully examined by experts in mathematics and measurement and evaluation. The researchers created the Google form to distribute the test items, and 15 (10 males and five females) panellists examined the essentiality and non-essentiality of the test items between 10-30th April 2022. Responses gathered from the 15 panellists were subjected to a content validity ratio (CVR) and, in turn, established a content validity index (CVI) (Lawshe, 1969) of 0.59. Also, the responses of the sampled students outside the study were subjected to a reliability analysis to determine the instrument's internal consistency. Kuder Richardson 20 (Kr20) reliability estimate for the mathematics achievement test yielded 0.84 implemented using the ‘validateR’ package of R programming language version 4.0.1 software.

2.5 Data collection procedures

The data was collected from students in public high schools in Ondo central senatorial district, Nigeria, between 5-30th June 2022. Students in grade 11 were intactly used, and they responded to the mathematics achievement test in the English language. Respondents were provided printed instruments, and four research assistants assisted with onsite administration. Before participating in the study, all participants were informed about its purpose and consented.

2.6 Data analysis

The independent and dependent variables were analysed using descriptive statistics to determine central tendencies (mean) and dispersion (standard deviation). Students' ability (low vs. high) and their time pressure (conditioned vs. unconditioned) were independent variables, while aberrance responses B* (beyond-ability) and W* (within-ability) were dependent variables. Inferential statistics using the 2×2 x 2 factorial MANOVA were generated to determine the differences in the participants' test anxiety and ability vis-à-vis their B* (Beyond-ability) and W*

(Within-ability) in the mathematics achievement test. Using a MANOVA, the assumptions of multivariate normality, homogeneity of variance, and the quality of the variance error of the dependent variables were examined. Due to the two dependent variables examined in this study, MANOVA was considered suitable for analysing the data. MANOVAs are suitable for analyses involving several factors (each with two or more levels) and multiple dependent variables, as Grice and Iwasaki (2007) explained. Analysis of the data generated from the two instruments was done using SPSS, version 28, and R, version 4.0.1, a programming language for statistical computing.

2.7 Ethical Declarations

The study obtained informed consent from all participants by completing a consent form. Respondents had no requirement to provide their names, so all data collected was anonymous.

3. Results

This section presents the analysis of data obtained from the field. Data collected were analyzed using Multivariate Analysis of variance (MANOVA) to test the hypotheses for difference at the 0.05 level of significance. This statistical tool was used unlike univariate tests, because it takes into account the interrelation among dependent variables, and analyses the variables simultaneously by reducing the probability of committing Type I error. The results were presented in tables and discussed based on the order of the hypotheses stated in the study. However, it is pertinent to state that all the assumptions (such as multivariate normality, homogeneity of variance, and linearity) underlying the statistical tool were all met.

Ho1: There is no significant main effect of response aberrance as measured by W* and B* and its association with ability.

In conducting MANOVA, the overall multivariate hypothesis must be tested first. This feat was achieved by assessing the test's significance associated with pillai's trace. Thus, if the null hypothesis is not rejected (that is no significance main effect), it is ideal to stop the interpretation of the analysis at that point and remark that the independent variables have no significance difference on the two dependent variables. Nonetheless, if it is evident that the multivariate test is significant, the researcher will then continue to assess which of the dependent variable is being influence by the independent variables. This was achieved by conducting series of univariate analysis of variance on individual dependent variable. Table 1 presents the overall multivariate hypothesis.

Table 1: Summary of multivariate test

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.754	835.905b	2	545	0.001	0.754
	Wilks' Lambda	0.246	835.905b	2	545	0.001	0.754
	Hotelling's Trace	3.068	835.905b	2	545	0.001	0.754

	Roy's Largest Root	3.068	835.905b	2	545	0.001	0.754
Time pressure	Pillai's Trace	0.017	4.659b	2	545	0.001	0.017
	Wilks' Lambda	0.983	4.659b	2	545	0.01	0.017
	Hotelling's Trace	0.017	4.659b	2	545	0.001	0.017
	Roy's Largest Root	0.017	4.659b	2	545	0.001	0.017
Ability	Pillai's Trace	0.148	47.402b	2	545	0.001	0.148
	Wilks' Lambda	0.852	47.402b	2	545	0.001	0.148
	Hotelling's Trace	0.174	47.402b	2	545	0.001	0.148
	Roy's Largest Root	0.174	47.402b	2	545	0.001	0.148
Time pressure * Ability	Pillai's Trace	0.035	9.776b	2	545	0.001	0.035
	Wilks' Lambda	0.965	9.776b	2	545	0.001	0.035
	Hotelling's Trace	0.036	9.776b	2	545	0.001	0.035
	Roy's Largest Root	0.036	9.776b	2	545	0.001	0.035

a. Design: Intercept + ability + time pressure + ability * time pressure

b. Exact statistic

Table 1 shows the result of MANOVA, which indicates that student academic ability significantly affects the combined dependent variables (DVs) of within-ability (W*) and beyond-ability (B*) with (Pillai's trace = 0.148, $F_{(2,545)} = 47.402$, $p < 0.05$, Eta squared $\eta^2 = 0.148$). These results show a significant mean difference in the combined DV of within-ability (W*) and beyond-ability (B*) among the examinees' abilities. However, the multivariate effect size was 14.8%. Also, it was revealed that time pressure significantly affect the combined dependent variables (DVs) of within-ability (W*) and beyond-ability (B*) with (Pillai's trace = 0.017, $F_{(2,545)} = 4.659$, $p < 0.05$, Eta squared $\eta^2 = 0.017$). This result shows a significant mean difference in the combined DV of within-ability (W*) and beyond-ability (B*) among the examinees when subjected to time pressure, and the multivariate effect size was 1.7%. Also, MANOVA results as presented in Table 3 indicate that the interaction of examinees ability and time pressure significantly influence the combined DVs of W* and B* of the Mathematics Achievement test with (Pillai's trace = 0.035, $F_{(2,545)} = 9.776$, $p < 0.05$, Eta squared $\eta^2 = 0.035$) while the multivariate interaction effect was low. Therefore, since the independent variables were significant, it is pertinent to evaluate the univariate analysis of dependent variables to see the effect of independent variables on them. Table 2 presents the test between subjects' effects.

Table 2: Tests between subjects' effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	W*	77.729a	3	25.91	41.464	0.001	0.186
	B*	309.232b	3	103.08	13.461	0.001	0.069
Intercept	W*	543.14	1	543.14	869.19	0.001	0.614
	B*	10438	1	10438	1363.1	0.001	0.714
Time pressure	W*	0.849	1	0.849	1.358	0.244	0.002
	B*	38.297	1	38.297	5.001	0.026	0.009
Ability	W*	58.217	1	58.217	93.166	0.001	0.146
	B*	165.25	1	165.25	21.579	0.001	0.038
Time pressure * Ability	W*	12.226	1	12.226	19.566	0.001	0.035
	B*	15.245	1	15.245	1.991	0.159	0.004
Error	W*	341.18	546	0.625			
	B*	4181.1	546	7.658			
Total	W*	929.81	550				
	B*	17302	550				
Corrected Total	W*	418.91	549				
	B*	4490.3	549				

R Squared = .186 (Adjusted R Squared = 0.181)

R Squared = .069 (Adjusted R Squared = 0.064)

Table 2 showed that the difference in the response aberrance displayed by the examinees as measured by each of W* ($F_{(1,546)}$ = 93.166, $p < 0.025$, Eta squared $\eta^2 = 0.146$) and B* ($F_{(1,546)}$ = 21.579, $p < 0.025$, Eta squared $\eta^2 = 0.038$) based on students' academic ability was significant at 0.025 level of significant. Consequently, the null hypothesis was rejected. The Adjusted R Squared value of 0.181 and 0.064 indicated that examinees' ability accounted for about 18.1% and 6.4% of the variation observed in the combined DVs of W* and B* of examinees in Mathematics, respectively. Figures 1 and 2 present a plot of estimated marginal mean for W* and B* for examinees' academic ability and time pressure.

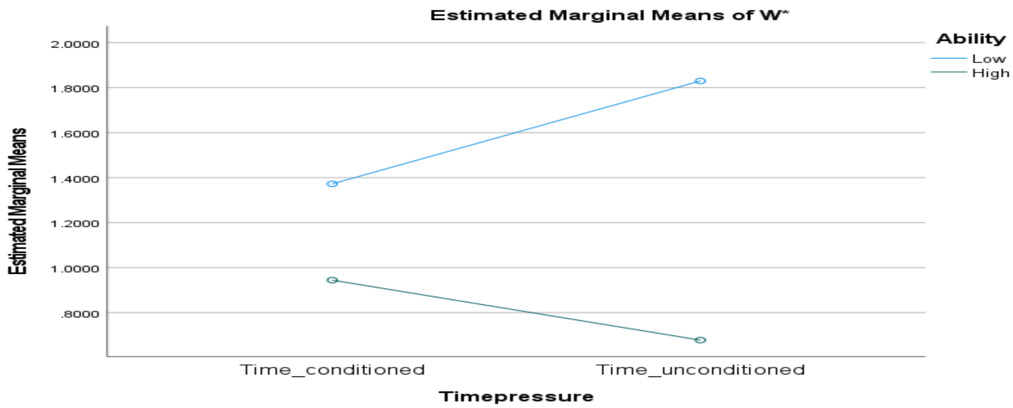

Figure 1: Simple plot on interaction effects between student ability and time pressure on within-ability (W*)

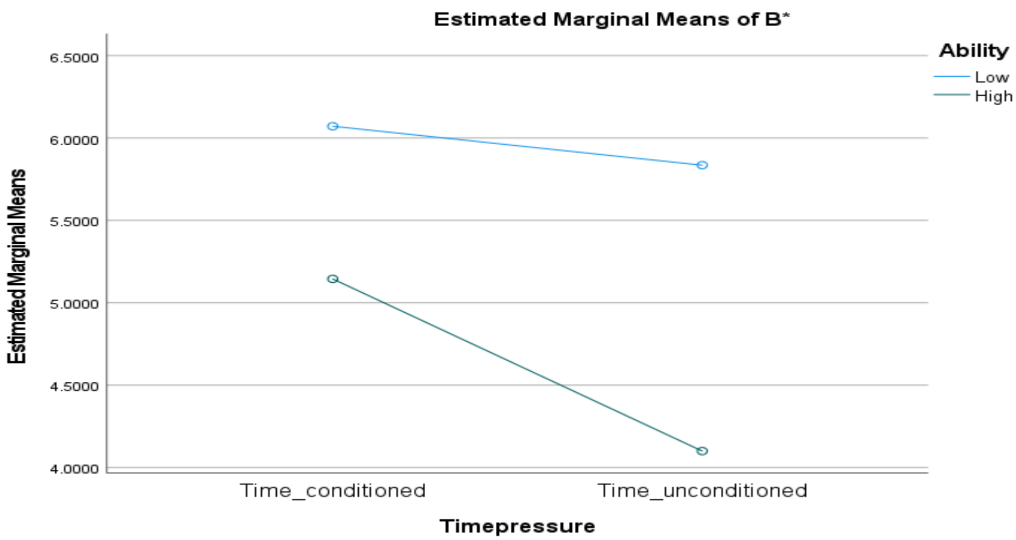

Figure 2: Simple plot on interaction effects between student ability and time pressure on beyond-ability (B*)

Figures 1 and 2 revealed the estimated marginal mean of within-ability (W*) values for examinees with low and high ability (*M* =1.601 and M = 0.811), while that of beyond-ability (B*) values for examinees with low and high academic ability were (*M* = 5.953 and *M* = 4.623). This indicated that for within-ability (W*), examinees with low ability exhibited higher response aberrance. Meanwhile, the W* and B* mean values were above 0.5 benchmarks. More so, it was crystal clear that the response aberrance of low-ability examinees was more than that of high-ability examinees as measured by W*. This indicates that the examinees missed some questions within the confines of their ability level. Also, the response aberrance as measured by B* for low-ability examinees was more than that of high-ability examinees, which depicts that some examinees responded to items beyond their ability level.

Ho2: There is no significant difference in response aberrance as measured by W and B* and its association with time pressure.*

Table 4 showed that the difference in the response aberrance displayed by the examinees as measured by each of W* ($F_{(1,546)}$ = 1.358, p =0.244, Eta squared $\eta^2 = 0.002$) and B* ($F_{(1,546)}$ = 5.001, p = 0.026, Eta squared $\eta^2 = 0.009$) based on time pressure was statistically significant at 0.025 level of significant. Thus, the null hypothesis was rejected. The Adjusted R Squared value of 0.181 and 0.064 indicated that examinees time pressure accounted for 18.1% and 6.4% of the variation observed in the combined DVs of W* and B* of examinees in mathematics achievement test. The implication is that the time allotted for any examination goes a long way in determining the response pattern of examinees to the questions. Moreover, figures 1 and 2 revealed that the estimated marginal means of within-ability (W*) values for time condition and unconditioned were (*M* =1.159 and M = 1.254), while that of beyond-ability (B*) values for examinees time condition and time unconditioned were (*M* = 5.608 and *M* = 4.968). This indicated that for within-ability (W*) examinees with time unconditioned exhibited higher response aberrance. However, generally, the W* and B* mean values were above 0.5 cutoff. Furthermore, figure 1 showed that the response aberrance of examinees with time unconditioned was more compare to time condition as measured by W*. This remarked that the examinees missed some of the items due to their carelessness. More so, the response aberrance as measured by B* for time condition was higher than time unconditioned, which indicates that examinees responded to some items due to pressure.

Ho3: There is no significant interaction of ability and time pressure on response aberrance as measured by W and B**

The results revealed that the interaction effect of ability and time pressure as measured by each of W* was statistically significant ($F_{(1,546)}$ = 19.566, P = 0.001). The null hypothesis was rejected. The partial Eta square of (η^2) = 0.035 indicating that the observed interacting effect size of the ability and time pressure as measured by W* was 3.5%. This was considered to be a low effect size. Also, table 2 remarked that the mean scores as measured by B* did not differ significantly between ability and time pressure with $F_{(1,546)}$ = 1.991, P = 0.159, partial Eta square of (η^2) = 0.004. The effect size was very low.

4. Discussion

This research used a cross-sectional survey design to investigate the abnormal behavior of high school students in Ondo State during a mathematics achievement test, specifically in relation to academic ability and time pressure. The study included ten high schools selected from one of the three senatorial districts in Ondo State. By using the well-known abnormal indices W* (Within-ability or caution index) and B* (Beyond-ability or surprise index), abnormal scores were estimated through person fit analysis. A total of 550 Grade 11 students participated, with 57.7% being male and 44.3% female. The mathematics achievement test and Person Fit analysis were used to examine participants based on the research hypotheses. Low scores were classified as 1-24, while high scores ranged from

25-50. The findings indicated that students' response patterns deviated from the expected, establishing abnormal behavior in their responses. This aligns with Petridou and Williams' (2007) study, which also used a person-fit method to measure abnormality at a class level. The study emphasized the significance of time pressure as a variable, revealing that students exhibited a significant difference when exposed to conditioned and unconditioned time pressure. Conditioned and unconditioned time pressure was found to moderate students' ability in the test, with those under unconditioned time displaying higher ability than those subjected to a conditioned time limit. This is consistent with Chen's (2005) and Adediwura and Agunbiade's (2015) findings, which also observed similar effects of time pressure on students' ability and abnormal responses. Contrary to expectations, the study found a significant moderate relationship between time pressure and aberrant response, despite the belief that response aberrance produces opposite effects based on ability and time pressure. Specifically, hypothesis 5 and the analysis of the W* and B* indices highlighted the considerable influence of time pressure on aberrant response. The research supported the idea that mathematical ability is influenced by inherent aptitude and significantly impacted by time pressure. It emphasized the importance of considering time pressure as a crucial factor in understanding expected and aberrant test responses. The research supported the idea that mathematical ability is influenced not only by inherent aptitude but also significantly impacted by time pressure. It emphasized the importance of considering time pressure as a crucial factor in understanding expected and abnormal test responses. In summary, the study provided insights into the relationship between mathematical ability, time pressure, and abnormal behavior among high school students in Ondo State.

5. Conclusion

In conclusion, this empirical study significantly contributes to the existing body of literature on aberrant behavior in the context of mathematical achievement tests, particularly under the influence of time pressure. By addressing a notable gap in the literature, the research sheds light on the intricate relationship between students' ability, time pressure, and aberrant responses. The comprehensive examination of students' patterns of response under both timed and untimed conditions has yielded valuable insights. The findings underscore the substantial impact of time pressure on students' mathematical abilities, with timed responses being identified as a hindrance that exacerbates aberrant behavior. Notably, examinees with lower ability levels are prone to underperforming even more when subjected to conditioned time pressure during examinations. The study emphasizes the pivotal role of time allocation in shaping examinees' response patterns and highlights the correlation between academic ability levels and the degree of aberrant behavior observed in examinations. The study's outcomes have practical implications for educators, policymakers, and practitioners looking to enhance mathematics education. Firstly, recognizing the influence of time pressure on students' mathematical abilities suggests a need for individualized instruction. Educators should tailor their teaching methods, provide additional support for students facing time constraints, and consider alternative assessment approaches that provide a more comprehensive evaluation of mathematical skills. Moreover, understanding the impact of conditioned and unconditioned time pressure on students' performance requires adjustments in testing conditions. Educators and examiners should carefully consider the time limits set for mathematics assessments and may need to provide flexibility or additional time accommodations to ensure a fair and accurate evaluation of student's mathematical abilities. Educator professional development programs should focus on enhancing teachers' awareness of potential aberrant behaviors and equipping them with strategies to address and support students exhibiting such behaviors effectively. This includes understanding the nuances of aberrant responses and implementing targeted interventions. The study also suggests that schools and educational institutions can use the findings to inform the design of academic support services. Tailored interventions can be developed based on recognizing that students may display different levels of aberrant behavior depending on their mathematical abilities and responses under time pressure. Policy considerations should also be taken into account. Policymakers in the education sector may need to review and adjust policies related to standardized testing, including strict time limits or exploring alternative assessment methods that allow for a more nuanced evaluation of mathematical abilities. The study not only provides practical implications, but also suggests opportunities for further research. Future studies could delve deeper into specific instructional strategies, the impact of varying time limits, and the long-term effects of accommodating time pressure on students' mathematical learning outcomes. By incorporating these practical implications, educators and policymakers can work towards creating a more inclusive and effective mathematics education environment that accounts for individual differences in abilities and response patterns under time constraints.

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