

Detrimental external factors that influence performance of students who repeat Psychological Statistics

Hamed S. Haque, Harris Shah Abd Hamid

International Islamic University Malaysia, Gombak, Kuala Lumpur, 53100, Malaysia

Abstract

Psychology students generally dread their undergraduate statistics course. The current study explored the detrimental external factors that influence students to perform poorly in statistics courses. In-depth interviews were conducted on six undergraduate psychology students from International Islamic University Malaysia who failed a statistics course and the data was analyzed using thematic analysis. Eight factors were obtained (with a total of 19 sub-factors) and were arranged under the Lecturer, Social Support, Administrative, and Environmental categories. The findings of the study would provide statistics lecturers with a better understanding of why many of their students face difficulty in the course.

Keywords: statistics; psychology students; thematic analysis

1. Introduction

Almost every undergraduate psychology program contains at least one introductory statistics course. This course is numerical in nature and covers both descriptive and inferential statistics (Lalonde & Gardner, 1993). It has been shown that students tend to do poor in this course and that the study strategies they use tend to be relatively ineffective (Derry, Levin, Osana, & Peterson, 2000). The study strategies they employ during other theoretical and knowledge-based courses do not transfer well to Psychological Statistics. There are several reasons given for this state of affairs. One is that quantitative reasoning requires deep understanding of four disparate kinds of thinking – algorithmic, logical-deductive, visual-dynamic, and verbal-interpretive (Cobb, 1997). Since these skills are wildly different, students understandably face difficulties when trying to study for the course. And since many of the students who choose to major in psychology do not have extensive background in mathematics or science, they struggle hard to learn the numerous concepts and modes of thinking. Wild and Pfannkuch (1999) investigated the thought processes involved in statistical reasoning and made similar points with regards to learning statistics. The lack of practice and background in these kinds of rigorous thinking causes students to struggle with statistics (Bloomers & Forsyth, 1977). Thus, it can be considered that the course material is somewhat advanced for the average psychology undergraduate student.

Another reason for students to face problems is that some students who pursue a degree in Psychology tend to loathe numerical courses. This is a manifestation of the general anti-quantitative bias sometimes seen among social science students (Zimprich, 2012; Byrne, 2012). However, this should not be generalized to all social science students and many scorn the idea that they are refugees from harder and more challenging disciplines. Regardless of the diverse population of students who make up all psychology students, many, when they learn that they must take a statistics course, change to less quantitative disciplines (Tremblay, Gardner, & Heipel, 2000).

These and other factors lead students to develop an aversion to statistics. Many teachers of statistics, aware of this growing sentiment, developed curricula attempting to foster

11th International Postgraduate Research Colloquium



appreciation of statistics among students (Dilbeck, 1983; Hastings, 1982). These attempts underlie the vast research that tries to identify and assess the various predictors of statistics achievement.

Despite the common disdain shown towards statistics, its importance to the field of psychology is undeniable. Psychology students must be trained in statistical and research methods if the science of psychology is to unify and progress (Aiken, West, & Millsap, 2009). Other natural science disciplines had to improve their research and statistical methods before they were able to grow and develop to the state they are today. Being able to understand and conduct research are essential skills future psychologists must have and these skills must be taught to them. If not, they would be unable to collect, analyze, and interpret data (Aiken, West, Sechrest, & Reno, 1990). And even if they must perform statistical tests, their results may be fraught with errors that could lead to false conclusions.

Therefore, it is imperative that statistics is taught and presented to students in a way that facilitates their understanding and quells their fears (Forte, 1995). This is not an impossible task but it must be taken seriously. The issue becomes even more important because the number of students taking the introductory statistics course is increasing (Garfield, Hogg, Schau, & Whittinghill, 2002). This could be due to the large number of students who choose to major in psychology.

1.1. Justification of the study

The major problem caused by the above issues is students' failure to pass the course. The number of students failing in this course is higher than for other psychology courses. In the university in which the current study is conducted, the average failure rate in the statistics course, between 2010 and 2013, is 16.20% (Abd Hamid & Sulaiman, 2014). This number must be reduced to ensure that students learn statistics properly and that the course is taught in a way that may interest them.

The current literature does not show a comprehensive coverage of factors influencing students' academic performance in statistics courses. The literature review section shows that while many studies have identified various factors that predict statistics performance, most only focus on internal factors. Also, most of the studies conducted are quantitative in nature. Thus, they only measure pre-determined variables in relation to statistics performance (Tremblay, Gardner, & Heipel, 2000; Zimprich, 2012). There is no exploratory research attempting to ask students to identify the various additional factors.

1.2. Objective of the study

The current study attempts to identify the detrimental external factors that influence performance of students who repeat Psychological Statistics. The focus is on detrimental factors because those would be the factors that lead a student to display poor performance and ultimately risk failing and repeating the course.

2. Literature review

Most research on statistics performance and achievement among undergraduate students are quantitative in nature. Researchers attempt to identify the factors that influence statistics performance and, in doing so, tend to measure a number of psychological constructs. However, they are all internal factors and can differ between individuals. This section looks through the common factors that are measured alongside statistics performance. Not all the factors have high predictive validity or extensive research performed on it. But this overview demonstrates that, for the most part, external factors are neglected.

11th International Postgraduate Research Colloquium



2.1. Attitude

The attitudes towards statistics are generally measured in terms of positive vs. negative feelings towards various aspects of the course such as the course material and instructors (Tremblay, Gardner, & Heipel, 2000). The two most used measures of this variable are Statistics Attitude Survey (Roberts & Bilderback, 1980), Attitudes towards Statistics scale (Wise, 1985), and Statistics Course Evaluation (Lalonde & Gardner, 1993). A significant correlation of .27 between scores in the Attitude towards Statistics scale and grades in the statistics course was found (Wise, 1985). Lalonde and Gardner (1993), using their scale, Statistics Course Evaluation, found a correlation of .41 with the grade in the statistics course. Zimprich (2012) concluded that positive attitude towards statistics also has a positive influence on performance. Students generally have negative attitudes towards the use of statistics as a whole but positive attitudes towards their statistics course (Vanhoof, Sotos, et al, 2006).

2.2. Mathematical ability and background

Regarding mathematics in general, Schiefele and Csikszentmihalyi (1995) found that mathematical ability (measured using the mathematics section of the Preliminary Scholastic Aptitude Test (PSAT)) predicted grades of students in their first two years of university. Lalonde & Gardner (1993) found a significant correlation of .37 between mathematical background and grade in the statistics course and a correlation of .29 between mathematics achievement and grade in statistics. However, Strahan (1970) found that there was no relationship between SAT Mathematics scores and grades in statistics. Giambra (1976) has found that there is no relationship between mathematical background and statistics performance. Thus, the literature presents contradictory findings regarding the relationship between mathematical ability/background and statistics performance. This indicates that further research must be done to find whether it is a valid predictor of statistics performance.

2.3. Mathematics and statistics anxiety

Anxiety can be studied in the trait or state level (Spielberger, 1966), and the trait level is usually measured in connection to statistics performance. Numerous tests of anxiety are present, each dealing with specific situations. With regards to statistics performance, numerical anxiety (Betz, 1978) and statistics anxiety (Onwuegbuzie, 1995) are generally used. Lalonde and Gardner (1993) found negative correlations between statistics anxiety and statistics performance. A meta-analysis, conducted by Schwarzer, Seipp, and Schwarzer (1989) found a negative correlation of -.30 between mathematics anxiety and mathematics achievement. Though it is not regarding statistics specifically, the findings can be generalized (Tremblay, Gardner, & Heipel, 2000).

2.4. Motivation

While motivation has been thoroughly studied in terms of educational attainment and achievement, it has not been studied much in terms of statistics specifically. Lalonde and Gardner (1993) found a correlation of .32 between their Motivational Intensity scale and grade in the statistics course. Related to motivation is goal setting. Highly motivated individuals are more likely to set goals than less motivated individuals and their goals tend to be more realistic (Cox, 1998). Learning goals were related to individuals desire to acquire skills while performance goals were related to overcoming tasks to display aptitude and increase self-esteem. Bandalos, Finney, & Geske (2003) showed that both goal orientations led to better statistics performance. This relationship was mediated through study strategies and self-efficacy.

11th International Postgraduate Research Colloquium



2.5. *Self-efficacy*

According to Bandura (1977), self-efficacy is one's belief about one's ability to perform behaviors that should lead to expected outcomes. Self-efficacy has been shown to have a positive relationship with mathematics and statistics performance (Zohar, 1998). Finney and Schraw (2002) developed scales to measure statistics self-efficacy and found that statistics self-efficacy scores increased from the beginning to the end of the course. However, Benson (1989) found no relationship between self-efficacy and statistics performance.

2.6. *Summary*

The above survey of the literature only highlights internal and personal factors and therefore indicates that external factors are largely ignored by researchers. The effect of the environment, teacher, or classmates on a student's performance in statistics has not been evaluated. These come under a category of external factors and are important because they may determine students' grades in the statistics course. Therefore the current study attempts to investigate this neglected set of factors and identify them.

3. **Method**

3.1. *Participants*

The participants of the study were six undergraduate students ($n = 6$, four males and 2 females) who received a failing grade in Psychological Statistics. According to Guest, Bunce, and Johnson (2006), six interviews are sufficient to obtain meaningful themes if the sample has a high level of homogeneity. Convenience sampling was used to obtain the participants and the lecturer of the course was requested to help in the recruitment of participants. The ages of the participants ranged from 20 to 27. This range was due to the inclusion of students who already graduated but had failed Psychological Statistics during their undergraduate studies. Most participants repeated the course only once except for one who took it twice.

3.2. *Design*

In-depth one-to-one interviews were used to prevent the participants from being influenced by each other. Additionally, the topic of the interview may be sensitive to the participants and these prevented the researchers from using focus groups to collect data. Semi-structured interviews were used because they allow the participants sufficient freedom to discuss the various factors that caused them to fail the course. It was appropriate to suit the exploratory nature of the study.

3.3. *Materials*

From the literature review, only internal and personal factors that predict statistics performance were obtained. Since the interviews were meant to obtain external factors, questions were developed that asked participants about their lecturer, environment, or other external factors; all comprise the context in which the students learn. The interview guide began with questions about demographic information and later about the student's perception of the course in general. The second half of the interview guide had questions about specific external factors, to allow the participant to provide information relevant to the research objective.

11th International Postgraduate Research Colloquium



3.4. Procedure

The participants were informed of the nature of the study during their class time. Students who qualified as participants were encouraged to participate in the study. Many students were also informed of the study through word of mouth. Suitable time and venue was arranged with the individual participant. The interview session began with rapport building. Demographic questions were asked and then the participant was asked to state the reasons that caused him/her to not pass Statistics. This open-ended question allowed the participant to reveal the different reasons that caused him/her to fail Statistics. The researcher steered the discussion carefully to focus on the environmental factors, taking care not to lead the participant. At the end of the interview, the participant was debriefed and there was a short session to help the interviewee deal with the factors just mentioned. Before actual data was collected, a pilot study was conducted with one student who repeated Psychological Statistics.

3.5. Ethical considerations

Firstly, the subject matter of the interview may be sensitive to most participants as they would feel uncomfortable speaking about their failure. Thus, the interviewer assured them of confidentiality and ensured that the recording would be heard by the researcher only.

Secondly, speaking freely and frankly about their previous semester's Statistics grade may cause them to be depressed and demotivated. The interviewer had to take special precautions to ensure that these and other maladaptive effects did not occur.

Lastly, since the interview focused on external factors instead of internal and personal ones, the student may develop a skewed understanding of his/her past failure and begin to attribute all the blame to the lecturer and environment. This was a serious problem and during the debriefing session, the interviewer made it clear to the interviewee that personal factors play a very huge role in statistics achievement, despite the focus of the interview.

3.6. Data analysis

Thematic analysis was used to analyze the data. No prior theory was used in interpreting the information. Once the interview was conducted, it was transcribed by the researcher. Once the transcription was complete, the researcher listened to the audio or read the transcript several times to become well-informed and increase familiarization of the data.

The transcript was coded, with the initial coding being on a line-to-line basis. The resulting codes were later compiled and, by using analytical effort, combined to form over-arching themes. The different themes represented the different environmental factors. These themes that emerged are presented in the following section.

4. Results

This section discusses the factors that were identified after analysis of the six interviews. During the open coding stage, the transcripts were coded using the NVivo software and various ideas and themes emerged after investigation. Each code represented a fundamental idea expressed by a participant. These codes were later arranged in terms of 'Lecturer Factors', 'Personal Factors', 'Social Support', 'The Subject Itself', 'How to Improve', 'Emotion of the Student', 'Other Factors', and 'Post-Failure'. Many of the codes within each tree node were not relevant to the research question such as the 'Personal Factors' (which included blaming oneself and laziness) and 'Emotion of the Student' (which included statistics anxiety and prior perception of statistics). Thus, only the codes that were relevant were selected to become factors.

Once all the codes have gone through initial categorization, axial coding was performed.

11th International Postgraduate Research Colloquium



The ‘Lecturer Factors’ and ‘Social Support’ tree nodes became two of the major categories that would cover all factors. Codes within the other tree nodes were categorized under ‘Administrative since they were regarding the course itself. The last few factors, such as the timing and the venue, were placed under the smallest category, ‘Environmental’.

The total number of codes that emerged is 19 which. Table 1 presents the overview and arrangement of all the factors.

Table 1. List of factors and sub-factors.

Category	Factors	Sub-factors
Lecturer	Lecturer Preference	Preferred other statistics lecturer
	Communication of lecturer	The lecturer lacks soft skills Lecturer doesn't give proper feedback Lecturer cannot explain properly
	Emotion towards lecturer	Fear of the lecturer Perceives sexism (focuses on one gender only)
Social support	Aid from other students	Study groups that are too large Friends and classmates too busy to help peer
	Non-constructive classmates and seniors	Classmates may promote defeatist mentality Competent students induce inferiority complex in others Seniors make students fear statistics
Administrative	Course material difficult	Too much content Too much memorization involved The exam questions are not representative of class work. Statistics feels detached from other courses
	Neglect of weak students	No special help for weak students The initial quiz demotivated students
Environmental	Environment	Venue not suitable Timing is not suitable

4.1. Preferred other Statistics lecturer

“Actually I wanted Sir A. But I can't cause the only one teaching it last sem(ester) is Sir H.” (P5)

The Psychology department has two lecturers who teach Psychological Statistics and they have different teaching styles and approach. This causes some students to prefer one over the other. However, in a given semester, only one of the lecturers taught Psychological Statistics, preventing students from choosing the lecturer they desire. Thus, students who are forced to take the course with a lecturer they didn't want, are likely to blame the lecturer for their

11th International Postgraduate Research Colloquium



failure.

4.2. The lecturer lacks soft skills

“I: Ok, what was the thing that he lacked?”

F: Soft skills. Teaching requires soft skills cause you got to interact with the students. Students are like people. I would say teaching skills.” (P6)

This indicates that the lecturer could not effectively communicate with the students. The participant mentioned both soft and teaching skills, as if they were synonymous. Not being able to communicate harmoniously with students is a problem for any kind of teacher. However, it is more dangerous for Statistics lecturers because students can be easily alienated by the subject matter and thus makes it all the more necessary for the lecturers to bridge the gap.

4.3. Lecturer does not give proper feedback

“So whenever you ask him a question, or if you solve one question and ask him if it’s right, he would just say, “I don’t know.””(P3)

Not giving feedback is dangerous as it withholds information from students. This information, if provided, could help the student gauge his/her level of understanding and highlight areas of improvement. For a subject like Psychological Statistics (which includes memorization, analysis, calculation etc.), feedback is crucial.

4.4. Lecturer cannot explain properly

“If he or she really knows how to give formula in a simple way and clear manner, we don’t have any problem to understand. And if he or she prepared notes earlier to make us better understand.”(P3)

The participants indicate that they cannot understand when the lecturer is explaining. This could be due to the material being highly technical, but may also be because the lecturer, as the participant said, doesn’t give it in a “*simple and clear manner*”.

4.5. Fear of the lecturer

“When you study with lecturer you feel very afraid. Afraid to ask a question.”(P1)

One participant mentioned that the reason why he’s afraid of the lecturer is because he is the Head of Department. Thus, greater power distance between the student and lecturer creates more fear. P3 mentioned “*First, he looks not very friendly. Not really presentable to the students.*” It appears that the student is criticizing the physical appearance of the lecturer. Again, this cannot be reason to blame a lecturer. Possible reasons for students to feel fear are harsh behaviour or hostile attitude from the lecturer. None of the participants mentioned them and thus, the theme ‘fear of lecturer’ would stand without further justifications.

4.6. Perceives sexism (the lecturer focuses on the males)

“He’s more to boys. He focuses on the boys more.”(P3)

In most psychology classes in IIUM, the numbers of females greatly outnumber the number of males. Therefore, the males tend to stand out among the crowd and are highly noticeable. This may cause the lecturer to pay them a disproportionate amount of attention. Another reason why the lecturer may focus on males is because they are both of the same gender. Some inherent uncomfortableness may exist when interacting with members of an opposite gender.

11th International Postgraduate Research Colloquium



4.7. Study groups that are too large

“I wish we were only two or three studying together. Not many.”(P2)

Even if the student doesn't benefit for classes, there are other opportunities to learn. Study groups are one of the most prevalent methods used by students in IIUM. Students can learn from one another and there is little or no power distance between them. It is a manifestation of cooperation towards a shared goal.

4.8. Friends and classmates too busy to help peers

“Cause they are students too and busy with other courses. So whenever they are free you'd ask for help.”(P2)

This is something that looks quite unavoidable. When smart students are helping weaker ones, they are sacrificing a part of their time. Especially in a campus where the number of demands greatly increases at times, time is a very precious resource. Thus, a student that actually spends time helping others is engaging in prosocial behaviour and such actions, however minute, should be lauded.

4.9. Classmates may promote defeatist mentality

“F: Yeah. I think because back then the people I sit in class with are people who don't actually strive for greatness. I mingled badly in my first stats class. I was among those who actually put the blame on lecturers. I feel ashamed of myself back then. But then my second class, I made amends.”(P6)

By believing that statistics is extremely difficult and all the blame lies on the authorities who teach and enforce it upon the students, one creates a self-fulfilling prophecy. The student prepares himself/herself for failure. The actual difficulty of the course matters less once a student is already convinced that the course is tremendously hard.

4.10. Competent students induce inferiority complex in others

“I felt inferior. Because they were too fast in understanding and I was too slow.”(P2)

Feelings of inferiority reduce one's self-efficacy. Reduced self-efficacy is associated with poor performance. Thus, by feeling that one is weaker than the others, one may end up doing worse than what they are truly capable of.

4.11. Seniors make students fear statistics

“And also previously, the seniors approached the juniors and said “Statistics is like a killer subject. Dr A is gonna kill you!” Stuff like that. Because of that people will come with a mindset that it wouldn't be good. A self-fulfilling prophecy, if I quote you.” (P6)

As some participants mentioned, there is a culture of fear regarding Statistics. Even before a student registers for the course, he/she learns about how difficult and hard it is. This preconception colors the way in which the student would view the course. It prevents them from assessing it objectively since their seniors are unanimous in their evaluation of the course and, according to them, it is unlikely that they are wrong.

4.12. Too much content

“Then we had probability and these kind of stuff and I couldn't comprehend and understand what it is about.” (P1)

Despite all the various ancillary factors given by the participant, the one that almost all agreed on was that the course was difficult.

11th International Postgraduate Research Colloquium



4.13. Too much memorization involved

“I: So he expects you to memorize everything?”

E: Yeah.”(P5)

Statistical reasoning should practically involve thinking critically and analytically. However, most of the complaints of the students are about memorizing formulas. One could blame the students and claim that they are not learning the proper way, which is to understand the processes involved and not just plug in numbers to a formula.

4.14. The exam questions are not representative of class work

“But when it comes to quiz, it’s totally different from what he teach.”(P5)

It is understandable when the exam questions are harder than what is taught in class. However, the participant stated that they are totally different from what he teaches. The phrase ‘totally different’ could have a variety of meanings. Some students are used to having the same questions in the exams, just with the numbers and values changed. Thus, problems presented in novel forms may seem alien because they do not understand the underlying logic behind all the problems.

4.15. Statistics feels detached from other courses

“Yes. And in other universities, they have statistics from the beginning so everyone knows what they’re getting into. Here, statistics is kind of detached. Like a separate perspective. We have many other theoretical courses like developmental, social and not much technical ones.”(P4)

Most of the other courses in the psychology undergraduate curriculum do not require mathematics. The other Statistics subject, Lab-Based Statistics, doesn’t require a working knowledge of maths since most calculations are done by the computer. This makes the Statistics course very different from the other courses.

4.16. No special help for weak students

“I think they should identify which are the weaker student. Not to humiliate them, but because the weak student need special help and special mathematical clinic. Face to face. Because they really need to understand the basic and root of the formula and information. Special intervention.”(P3)

It is clear that most of the factors mentioned are especially potent to weak students. Their lack of prior mathematics background exacerbates all the other factors. Since some students have minimal maths experience, instead of expecting them to learn as well as the other students, special help should be provided for them.

4.17. The Initial Quiz demotivated students

“Dr. H gave us quiz. And I’m not sure if I scored any, even though it was basic mathematics. But I was like sad because I saw it as difficult but when I asked others they said it was basic. So I felt, there is a problem.”(P2)

In the first day of Statistics class, the students were given a small test to gauge their mathematics knowledge. Some of the students received very low scores and this highly demotivated them. They may have made the intention to work hard for the course but a small failure in the beginning (which they could not prepare for) triggered a chain of failures that grew bigger as the semester progressed.

11th International Postgraduate Research Colloquium



4.18. Venue not suitable

“Actually, in my opinion, the venue is very boring. The class in HS building is very boring. I think the environment in which you study is very important. First, the wall color is yellowish white. And suddenly I’m not comfortable in the class. And I’m left handed. You know, the table is for right-handed. When I study I need to push my body more, like this (twists). So the environment is not comfortable. For me I like someplace with carpet.”(P1)

The main reason why this participant claimed that the venue is not suitable is because he’s left-handed. This is a problem that applies to all the venue of all courses and not just Statistics. The desks are created for right-handed individuals and thus create difficulties for left-handed students.

4.19. Timing is not suitable

“The timing is quite sleepy for me. It was at 5. It’s not really good to do maths at that time. Maybe that’s a factor.”(P3)

Besides the venue, some participants disliked the timing of the class.

4.20. Summary

While many of the sub-factors are similar to each other, they highlight different and real problems that many students face. The sub-factors under the ‘Lecturer’ category point towards various criticisms the participants had towards their statistics lecturer. The ‘Social support’ category focused on friends, classmates, and seniors. The course content and departmental support were addressed in the ‘Administrative’ category while the venue and timing were the only two points under the ‘Environmental’ category. These span a wide range of areas. While some may not be valid factors that actually cause students to repeat the course, they were all mentioned by one or some of the participants.

5. Discussion and recommendations

In this final section, each of the eight factors would be evaluated. The factors obtained and categorized in the previous section were varied and covered a wide spectrum of topics. This section attempts to understand the reasoning behind each of the factors and how they may relate to statistics performance.

5.1. Lecturer preference

The first factor is regarding lecturer preference. There are two reasons that may have influenced students’ lecturer preference. First, the experience of other students convinced them which lecturer is strict and lenient. *“Because, like, my friends said that Sir A gave 30 marks for free.”* said P5. Second, if the student took the course previously, they may prefer to take it again with the same lecturer. *“If Dr. H was the lecturer when I took it a second time, it would be easier for me.”* was a statement uttered by P2. Having the same lecturer in both times allow the student to predict the obstacles he/she will face. According to Brown (2003), different lecturers have different teaching styles and different students have different learning styles. The best outcomes are achieved when the teaching style of the lecturer matches the learning style of the student (Stitt-Gohdes, 2003).

5.2. Communication of lecturer

The lecturer preference may affect all the other factors related to the lecturer. Regardless, some claimed that the lecturer could not communicate effectively with the students. There are

11th International Postgraduate Research Colloquium



several reasons that may cause this. First is having a poor grasp of the English language. P2 noted, “*His English is poor as everyone knows. I’m not saying my English is good but a lecturer should be better than this.*” Since the medium of instruction is English, inadequate language skills may hamper the communication process. Henderson and Wellington (1998) discussed the importance of breaking the language barriers in teaching and learning.

Another reason that may contribute to ineffective communication is the lack of proper feedback. Example of statements given by the lecturer are “*Find out yourself*” and “*You can google*”. The lecturer gave a direct instruction: check yourself. This strategy may help self-learning and encourage the student not to be too dependent upon the lecturer. It may be a means of emphasizing self-determination (Deci & Ryan, 2000) and thereby instilling intrinsic motivation to the students (Grolnick, Friendly, & Bellas, 2009). However, it is not a wise strategy because it makes the lecturer redundant. If all knowledge could be obtained by the students themselves, it is counterintuitive for the student to show up in class in the first place.

Interaction between the lecturer and students also arise when the lecturer is explaining concepts to them. This is a form of direct instruction (Bligh, 2000). It precedes solving problems and highlighting minute details within them. Participants claimed that the lecturer’s explanations were not simple or understandable. If this initial stage has flaws, students would not be able to grasp the material and would be confused from the start.

5.3. Emotion towards lecturer

The result of the behaviour of the lecturer can lead to the student fearing the lecturer. As a participant mentioned, the fear prevents him from asking questions. Thus, the curiosity or drive to know may be present but the fear that the lecturer incites paralyzes the student and effectively halts the learning process. Among the causes of fear is the fact that the lecturer is the Head of the Department. Though the qualifications or status of the lecturer should not cause the lecturer to come to blame, the lecturer needs to take pains to reduce the power distance between him and the students (Golish & Olson, 2000). This should be done to ensure that they are not intimidated by him.

Lastly, one participant mentioned that the lecturer focuses on males more. By paying more attention to one group over another, the lecturer risks alienating the neglected group. This is not an uncommon phenomena since teachers males tend to receive more attention from their teachers than females do (Jones & Dindia, 2004). Therefore, this is unlikely to indicate sexism for the lecturer himself may not be aware of it. The action of focusing on one group over another could be unconscious. Thus, the lecturer simply needs to be aware that micro inequalities can occur and to guard against them.

5.4. Aid from other students

Sometimes students who are weak in Statistics could feel the same sort of inferiority in class in the study groups too. In large study groups, the weak student may be the only one who doesn’t understand a simple concept. Admitting it to a close friend who is willing to teach is healthy. But to do so in a large group of people may be embarrassing (Asch, 1956). This could act as a barrier to learning.

Thus, as the participant mentioned, the study groups optimally should have just two or three students. While larger groups may be preferable in other instances or courses, for a poor student who is trying to grasp the fundamental ideas of Statistics, a small supportive group may be best. But the matter remains is that the weak students are still dependent upon the generosity of the smart students. If they choose to withhold their help for any reason, the student could do nothing. One way of mitigating this problem is through making some form of help mandatory. Some form of reward, monetary or not, that can be given to encourage prosocial behaviour among Statistics students (Ariely, Bracha, & Meier, 2009).

11th International Postgraduate Research Colloquium



5.5. Non-constructive classmates and seniors

Even outside of study groups, the attitudes of students can have a profound effect on others. If a student's classmates are pessimistic about the course and have ill-feelings towards it, the student may develop them too (Brown, Clasen, & Eicher, 1986). It takes extra effort to resist the cynical outlook of others. But for students who are already struggling in their Statistics class, the narrative provided by their peers looks more attractive. It reinforces their behaviour and allows them to blame other people for their mistakes. It encourages students to have an external locus of control (Rotter, 1954)

On the other spectrum, highly competent students can make weaker ones feel worse about themselves. One's self-perception is a huge determinant of one's performance. By seeing students understand the concepts clearly, one feels that the deficiency is with him or her. However, this inferiority is not necessarily negative. According to Adler (1927), striving for superiority follows from feelings of inferiority.

Seniors who make students fear the course are also a detrimental factor. They may have valid reasons for criticizing the course. Their experience with it may not have been pleasant and they are only being honest with their juniors. However, if they want to help the newer students succeed, it would be wise for them to emit encouraging and inspirational remarks instead of defeatist ones to prevent the students from developing learned helplessness (Abramson & Seligman, 1978)

5.6. Course material difficult

This should not be too big of a problem because the difficulty of a subject matter doesn't mean that it is not worth learning. The materials taught in universities are meant to be challenging and the students have to work hard to grasp the material. But the amount of content may be too much for students to bear. It may be more effective by dividing the course into two (as one participant suggested). This would allow for spaced learning and ensure that students learn at a pace they are comfortable with (Cain & Willey, 1939)

For some smart students, the course does not involve excessive memorization. With proper maths acumen, they can understand the logic behind every step and do not need to resort to memorization (Cobb, 1997). However, the vast majority of students are not very good in mathematics. Thus, it would not be surprising to find that most rely on memorization to succeed in the course.

Regarding whether the exams are representative of class work, this factor indicates that students try to keep up with the material in the classroom but are only stumped during the exams. Thus, only students who went beyond the classroom material would be able to score highly in the exams. While it seems unlikely that the exam questions were 'totally different' (as stated by a participant), congruence between the material taught in class and asked in exams should be ensured. This is important in understanding why students fail is because they may feel it has no benefit. They will be performing statistical tests using SPSS, not using a pencil and paper. However, the importance of understanding research and statistical methods should be stressed to students (Aiken, West, & Millsap, 2009).

5.7. Neglect of weak students

It is not a secret that the students in the Psychological Statistics class have very different mathematical backgrounds. Some participants said that there was no help for the ones with poorer or no background. Instead of segregating the students, a remedial maths course that teaches basic math skills may suffice. Smith, Polloway, Patton, and Dowdy (2008) discuss interventions for students with learning disabilities. Similar principles may apply to those who are innumerate with regards to statistics.

Regarding the initial quiz given to students, the quiz may have been necessary but

11th International Postgraduate Research Colloquium



highlighting the results to them when they are vulnerable (at the beginning of a dreaded course), may not be wise. Rather, this quiz could be used to identify weak students to provide special interventions for them (Smith, Polloway, Patton, & Dowdy, 2008). And if no such programs were present, the least is to hide the results and not expose each student to their weaknesses. However, this may prove to be worse since it prevents students from knowing their actual level of mathematics.

5.8. Environment

Unsuitable venue and timings were the two major complaints students had regarding the environment. The tables in the classrooms are small. The fact that there are a lot of materials to keep track of during the Statistics class, makes it necessary that more sophisticated venues are chosen for future classes.

It should be made clear that these factors do not work in isolation, for students would not fail Statistics simply because the classes were in the early morning or late in the evening. However, the cognitive functioning of the students is lower during the afternoon (Mackenberg, Broverman, & Vogel, 1974). In the evenings, after 5 pm, the students have finished a day of classes and are exhausted. They could be said to undergo ego depletion. Thus, Statistics, a course that requires high level mental processes, may be too heavy to be absorbed by the tired minds.

6. Conclusion

This study has answered the research question which was to identify the various external factors that influence performance of students who repeat Psychological Statistics. Eight major factors were obtained and were grouped under four categories. However, the factors seem very general and the most helpful ideas would be found in the sub-factors, of which there were nineteen. The 19 sub-factors highlight different aspects of the course and future research should measure the relative effect of each factor on the students' performance

This study provides future researchers with possible factors that could be studied in association with statistics performance. It asserts the importance of external factors and urges other researchers to study them more. This study also is useful for psychology departments around the world and would give them information that is necessary for ensuring that their students do not face unnecessary problems in Psychological Statistics.

References

- Abd Hamid, H.S., & Sulaiman, M. K. (2014). Statistics anxiety and achievement in a statistics course among psychology students. *International Journal of Behavioral Science*, 9(1), 55-66.
- Abramson, L. Y., Seligman, M. E., & Teasdale, J. D. (1978). Learned helplessness in humans: critique and reformulation. *Journal of Abnormal Psychology*, 87(1), 49.
- Adler, A. (1927). Individual psychology. *The Journal of Abnormal and Social Psychology*, 22(2), 116.
- Aiken, L. S., West, S. G., Sechrest, L., & Reno, R. (1990). Graduate training in statistics, methodology, and measurement in psychology: A survey of PhD programs in North America. *American Psychologist*, 45(6), 721.
- Aiken, L. S., West, S. G., & Millsap, R. E. (2009). Improving training in methodology enriches the science of psychology. *American Psychologist*, 64(1), 51-52
- Ariely, D., Bracha, A., & Meier, S. (2009). Doing good or doing well? Image motivation and monetary incentives in behaving prosocially. *The American Economic Review*, 99(1), 544-555.
- Asch, S. E. (1956). Studies of independence and conformity: I. A minority of one against a

11th International Postgraduate Research Colloquium



- unanimous majority. *Psychological Monographs: General and Applied*, 70(9), 1-70.
- Bandalos, D. L., Finney, S. J., & Geske, J. A. (2003). A model of statistics performance based on achievement goal theory. *Journal of Educational Psychology*, 95(3), 604.
- Bending, A. W., & Hughes, J. B. (1954). Student attitude and achievement in a course in introductory statistics. *Journal of Educational Psychology*, 45(5), 268.
- Benson, J. (1989). Structural components of statistical test anxiety in adults: An exploratory model. *Journal of Experimental Education*, 57(3), 247-261.
- Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Counseling Psychology*, 25(5), 441.
- Bligh, D. A. (2000). *What's the Use of Lectures?* Jossey-Bass
- Blommers, P. J., & Forsyth, R. A. (1977). *Elementary statistical methods in psychology and education* (pp. 310-13). Boston, MA: Houghton Mifflin.
- Brown, B. L. (2003). Teaching Style vs. Learning Style. Myths and Realities. *Educational Resources Information Center*, 26, 3-4.
- Brown, B. B., Clasen, D. R., & Eicher, S. A. (1986). Perceptions of peer pressure, peer conformity dispositions, and self-reported behavior among adolescents. *Developmental Psychology*, 22(4), 521.
- Byrne, D. (2012). UK sociology and quantitative methods: are we as weak as they think? or are they barking up the wrong tree?. *Sociology*, 46(1), 13-24.
- Cain, L. F., & Willey, R. D. V. (1939). The effect of spaced learning on the curve of retention. *Journal of Experimental Psychology*, 25(2), 209.
- Cobb, G. W. (1997). Mere literacy is not enough. *Why numbers count: Quantitative literacy for tomorrow's America*, 75-90.
- Cox, R. H. (1998). *Sport psychology: concepts and applications* (No. Ed. 4). McGraw-Hill.
- Derry, S. J., Levin, J. R., Osana, H. P., Jones, M. S., & Peterson, M. (2000). Fostering students' statistical and scientific thinking: Lessons learned from an innovative college course. *American Educational Research Journal*, 37(3), 747-773.
- Dillbeck, M. C. (1983). Teaching statistics in terms of the knower. *Teaching of Psychology*, 10(1), 18-20.
- Finney, S. J., & Schraw, G. (2003). Self-efficacy beliefs in college statistics courses. *Contemporary Educational Psychology*, 28(2), 161-186.
- Forte, J. A. (1995). Teaching statistics without statistics. *Journal of Social Work Education*, 31(2), 204-218.
- Garfield, J., Hogg, B., Schau, C., & Whittinghill, D. (2002). First courses in statistical science: The status of educational reform efforts. *Journal of Statistics Education*, 10(2), 456-467.
- Giambra, L. M. (1970). Mathematical background and grade-point average as predictors of course grade in an undergraduate behavioral statistics course. *American Psychologist*, 25(4), 366b.
- Golish, T. D., & Olson, L. N. (2000). Students' use of power in the classroom: An investigation of student power, teacher power, and teacher immediacy. *Communication Quarterly*, 48(3), 293-310.
- Grolnick, W. S., Friendly, R., & Bellas, V. (2009). Parenting and children's motivation at school. *Handbook of Motivation at School*, 279-300.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59-82.
- Hastings, M. W. (1982). Statistics: Challenge for students and the professor. *Teaching of Psychology*, 9(4), 221-222.
- Jones, S. M., & Dindia, K. (2004). A meta-analytic perspective on sex equity in the classroom. *Review of Educational Research*, 74(4), 443-471.
- Lalonde, R. N., & Gardner, R. C. (1993). Statistics as a second language? A model for predicting performance in psychology students. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 25(1), 108.

11th International Postgraduate Research Colloquium



- Mackenberg, E. J., Broverman, D. M., Vogel, W., & Klaiber, E. L. (1974). Morning-to-afternoon changes in cognitive performances and in the electroencephalogram. *Journal of Educational Psychology*, 66(2), 238.
- Onwuegbuzie, A. J. (1995). Statistics test anxiety and female students. *Psychology of Women Quarterly*, 19(3), 413-418.
- Patton, J. R., Smith, T. E., & Polloway, E. A. (1998). *Attention-deficit/hyperactivity disorder in the classroom: A practical guide for teachers*. Pro-Ed.
- Roberts, D. M., & Bilderback, E. W. (1980). Reliability and validity of a statistics attitude survey. *Educational and Psychological Measurement*, 40(1), 235-238.
- Rotter, J. (1954). Locus of control. *Perspectives on Personality*, 371-2.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68.
- Schiefele, U., & Csikszentmihalyi, M. (1995). Motivation and ability as factors in mathematics experience and achievement. *Journal for Research in Mathematics Education*, 163-181.
- Stitt-Gohdes, W. L. (2003). Student Teachers and Their Students: Do Their Instructional and Learning Preferences Match?. In *Business Education Forum* (Vol. 57, No. 4, pp. 22-27).
- Strahan, R. (1970). More on correlates of success in undergraduate statistics. *American Psychologist*, 25(12), 1175.
- Tremblay, P. F., Gardner, R. C., & Heipel, G. (2000). A model of the relationships among measures of affect, aptitude, and performance in introductory statistics. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 32(1), 40.
- Vanhoof, S., Sotos, A. E. C., Onghena, P., Verschaffel, L., Van Dooren, W., & Van den Noortgate, W. (2006). Attitudes toward statistics and their relationship with short-and long-term exam results. *Journal of Statistics Education*, 14(3), n3.
- Wild, C. J., & Pfannkuch, M. (1999). Statistical thinking in empirical enquiry. *International Statistical Review*, 67(3), 223-248.
- Wise, S. L. (1985). The development and validation of a scale measuring attitudes toward statistics. *Educational and Psychological Measurement*, 45(2), 401-405.
- Zimprich, D. (2012). Attitudes toward statistics among Swiss psychology students. *Swiss Journal of Psychology/Schweizerische Zeitschrift für Psychologie/Revue Suisse de Psychologie*, 71(3), 149.
- Zohar, D. (1998). An additive model of test anxiety: Role of exam-specific expectations. *Journal of Educational Psychology*, 90(2), 330.