

**LEFT HANDEDNESS AND ASSOCIATED
PSYCHOSOCIAL CORRELATES AMONGST
SECONDARY SCHOOL STUDENTS IN IBADAN,
NIGERIA**

BY

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DECLARATION

I hereby declare that this work is original. It was done by me and has not been presented in part, or whole, to any other college for a fellowship or diploma nor has it been submitted elsewhere for publication.

Lawal Kehinde Oluwasola Abiodun

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CERTIFICATION

This is to certify that the conduct of this study and preparation of this thesis were carried out by Kehinde Oluwasola Abiodun Lawal in the Centre of Child and Adolescent Mental Health, University of Ibadan under my supervision.

Professor Olayinka O Omigbodun

Principal Investigator

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Date

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DEDICATION

This book (and the accompanied turmoil) is dedicated to you.
You know who you are.

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I am deeply grateful to Professor Olayinka Omigbodun, my supervisor, who did more than just supervising this work. God bless you immensely.

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Key to Abbreviations (Acronyms)

ADHD:	Attention Deficit and Hyperactivity Disorder
CD:	Conduct Disorder
CI:	Confidence interval
DSM:	Diagnostic and Statistical Manual of Mental Disorders (IV)
EHI:	Edinburgh Handedness Inventory
ISCO:	International Standard Classification of Occupations
KSADS:	Kiddie-Schedule for Affective Disorders and Schizophrenia
LH:	Left handers
LQ:	Laterality Quotient
LRRTM:	Leucine-rich Repeat Trans-membrane protein.
OR:	Odd Ratio
ODD:	Oppositional Defiant Disorder
RH:	Right handers
SDQ:	Socio-demographic Questionnaire
SPSS:	Statistical Package for Social Sciences
SUD:	Substance use disorder
WHO:	World Health Organization

ABSTRACT

Background: About ten percent of the world's population is left handed (LH), but in many parts of the world, especially in low and middle income countries such as Nigeria, the use of the left hand is culturally frowned upon and actively discouraged or suppressed. Parents, community elders and teachers often exert significant pressure including punishments to actively dissuade children who are left-handed from using it freely. Ultimately, a significant majority in these cultural settings are converted into using their right hands. However, studies from other parts of the world, have indicated that this forced conversion from left handedness into right-handedness is often associated with mental health problems especially in children and adolescents. Yet there is a paucity of studies evaluating this association in Nigeria.

Aim: To assess the prevalence of psychiatric morbidity and its correlates among LH students compared with right-handed (RH) students.

Methodology: A total of 875 students were screened with the Edinburgh Handedness Inventory. Subsequently, 53 LH students and 53 matched RH students were interviewed with a 3-item questionnaire on sociocultural pressure and the Schedule for Affective Disorder and Schizophrenia for School-Age Children (K-SADS) for the former (LH students only); while only the K-SADS was utilized for the latter group (RH students).

Result: The prevalence of left handedness among the screened students was 6.05%. The prevalence of any psychiatric disorder was 37.7% for LH as compared to 10% for the RH comparison group. Most LH (73.6%) students reported being persistently discouraged from using the left hand for common tasks. LH students with experience of sociocultural pressures against use of their dominant left hand were more likely to have a psychiatric diagnosis than those who do not experience such pressures (46.2% v. 14.3% $X^2=4.453$, OR=5.155, $p=0.035$).

Conclusions: Left handed students had higher rates of psychiatric disorders as compared to RH students, and LH students who reported being pressured had even more elevated risks. Public awareness campaigns should be directed towards educating care-givers, teachers and parents about handedness as a biologically mediated process, as well as the risks of pressurising children to change their handedness (sinistrality).

Key Words: Left-handedness, adolescents, Ibadan, psychiatric morbidity

Chapter One

Introduction

1.1 Background

The evidence for left handedness as a risk factor for mental and behavioural disorders in adolescents is controversial (Coren and Halpern, 1991; Harris, 1993). Notwithstanding this fact, there are widespread negative views on left hand preference in children and adolescents. Zverev (2006), in a cross-sectional study evaluating cultural and environmental pressure against left-hand preference in urban and semi-urban Malawi, found that majority of respondents including parents, teachers, colleagues and church leaders, indicated that the left hand should not be preferred for habitual activities, and that left-handers should be forced to change to the right hand. Similarly, Adeoye & Dada (2004) found that a sample of university undergraduate students, including medical students in Lagos, Nigeria, perceived left-handedness to be particularly associated with mental and behavioural problems. In a prevalence study of left handedness among medical and dental students in the University of Lagos, Ademola *et al* found that the prevalence of left handedness decreased with age (Ademola et al., 2011). Fewer students in older age groups, compared to younger students were left-handed.

In a study among children and mothers attending under-five outpatient healthcare facilities in Enugu, southeast Nigeria, less than 10% of children were identified to be left-handed, a rate comparable to some reports elsewhere in the world. This suggests that there may be pressure against the phenotypic expression of the left hand in the general population in Nigeria. This pressure against expression of left handedness in children and adolescents has been found to be

associated with elevated risk for mental and behavioural disorder in left handed individuals (Porac and Searleman, 2002).

There is paucity of data about left handedness as well as associated psychological problems associated with societal pressure to discourage, suppress or shift sinistrality of children and adolescents in Nigeria.

1.2 Justification and relevance of the study

This study is justified for a number of reasons. First, prevailing socio-cultural norms dictate that the use of the left hand is seriously frowned upon in the society. Parents, guardians and even teachers often use extreme punitive measures to discourage a child from using the left hand. This study seeks to establish if such practices put the child at increased risk for significant psychosocial distress. Second, establishing the pattern of psychosocial distress that could be associated with left-handed individuals would provide an opportunity for designing preventive and therapeutic interventions. Lastly, identifying the likely source of the pressure against use of left hand will enable appropriate channelling of advocacy and public enlightenment programs.

1.3 Aim of Study

The overall aim of this study is to determine the pattern of psychiatric disorders in left handed adolescents.

1.4 The specific objectives are:

1. To determine the prevalence of left handedness in a school sample.
2. To determine the prevalence of psychiatric disorders in left handed students.
3. To determine the prevalence of psychiatric disorders in a matched sample of non-left handed (comparison group) students
4. To compare the prevalence of psychiatric disorders among the left and non-left handed students
5. To compare the prevalence of psychiatric disorders in students who report being persistently discouraged to use the left hand with those who do not.
6. To identify socio-demographic correlates that may be associated with the presence of psychiatric disorders in the study and comparison group.
7. To identify pattern of socio-cultural pressures against left handedness as experienced by the students.

1.5 Hypothesis

This study has two hypotheses, firstly that left handed students will have a higher prevalence of emotional and behavioural disorders compared with matched non-left handed students from the same population.

Null hypothesis: there will be no difference in the prevalence rates of emotional and behavioural disorders between left handed students compared with right handed students.

Alternative hypothesis: there will be difference in the prevalence rates of mental and behavioural disorders between left handed students compared with right handed students.

Secondly, left handed students who report being persistently discouraged to use the left hand will have a higher prevalence of psychiatric disorders compared with left handed students from the same population, who do not report being persistently discouraged to use the left hand.

Null hypothesis: there will be no difference in the prevalence rates of emotional and behavioural disorders between left handed students who reported being persistently pressured not to use their dominant hand and left handed students who did not report being persistently pressured.

Alternative hypothesis: there will be difference in the prevalence rates of emotional and behavioural disorders between left handed students who reported being persistently pressured not to use their dominant hand and left handed student who did not report being persistently pressured.

1.6 Primary outcome measure

The primary outcome for the study is the presence of emotional and behavioural disorders in the study participants measured with Kiddie Schedule for Affective Disorders and Schizophrenia Present and Lifetime version (K-SADS-PL).

1.7 Secondary outcome measure

The secondary outcome measure is socio-cultural pressures directed towards left handed study participants to prevent or change use of the dominant left hand. This is assessed with a 3-item questionnaire.

Chapter 2

Literature Review

2.1 Introduction

Historically, in most languages around the world the word left represents weak, clumsy, or evil. For instances, the Anglo-Saxon term for left is *lyft* which also means weak or broken (Coren, 1993). In Latin the term *sinistrum* refers to left but it also represents the sinister-evil (Stone, 2013). As language shapes human expression, it is possible that these origins over time led to the left side being associated with weakness or evil. The validation of the association of the left side, or left-handedness, with evil can also be seen in religion. In Christianity, the “right hand of God” is the considered the favourable side, while the left side is the “judgment hand”, reserved for evil doers (King James Version, 1611a, 1611b). In the Muslim community the left hand is the dirty hand while the right hand is reserved for clean acts (Islam, 2010).

About ten per cent of the world population is left handed and these individuals have frequently been discriminated against because of these negative attributions to left-handedness (Coren, 1993). Whether the attributions are true or even justified has been the subject of longstanding academic interest and debate. The relative prevalence of left handers among individuals with neurodevelopmental disorders seems to suggest that indeed left-handedness must confer some risk on the individual. The nature of this risk and the pathophysiology is still been unravelled.

However, others have argued that the risk of left-handedness towards neurocognitive dysfunctions and other mental and behavioural disorders is in itself minimal. The psychosocial atmosphere in which left handers are made to use right-handed tools and equipment, and generally adapt to a world designed for the right-handed may be the real culprit. From infancy certain cultures use

extreme methods to attempt to change the handedness of the child. These practices may predispose to later development of psychological distress, poor school performance and even overall poorer outcomes in life.

In Nigeria and other developing countries, the prevalence of left-handedness is below those of countries like Canada and United States. The suggestion is that this difference is iatrogenic and children's parents or caregivers may be preferentially against the expression of left-handedness in the children.

2.2 Definition of Handedness

The term handedness refers to the hand that a person prefer to use, or the hand that performs better for most tasks. It is a compound term, representing behavioural phenotypes that encompass two characteristics: asymmetrical proficiency in performance of manual tasks and preference regardless of speed and accuracy in task performance (Provins and Magliaro, 1993; Annett, 2002). Whether both dimensions of handedness, that is preference and proficiency, are related or are separate constructs, is not clear. What is certain is that both are strongly correlated. Handedness is conceptualized as existing on a continuum. The range is from complete left-handedness through ambidexterity to complete right-handedness (Annett, 2002). This is because preference and proficiency vary from task to task and there are individuals who are equally proficient on both hands simultaneously.

Complete left handedness is the exclusive preference or proficiency of the left hand for most tasks, whilst complete right handedness is the exclusive preference or proficiency of the right hand for most tasks. Ambidexterity is the ability to use either hand equally well for most tasks. The estimated prevalence of right handedness in the general population is 88 - 90% while the

prevalence for left handedness is between 10-12%. There is a slight male preponderance in left-handedness, with a male-to-female ratio of 1.23. Additionally, wide variations have been noted in studies of handedness across different cultures and society. For instance, lower prevalence values are reported in countries like Congo, Hong Kong, and Nigeria (Uwaezuoke et al., 2015), whilst higher prevalence of left-handedness is reported from studies in USA, Canada and Scotland. These observations, and the underlying assumption that the prevalence of handedness ought to be uniform across countries based on its mode of inheritance, have led to the theory that there might be environmental pressures against the expression of left handedness in certain cultures and countries.

2.3 Brain Lateralization and Handedness

The human brain has two distinct cerebral hemispheres connected together by the corpus callosum. Lateralization is the phenomenon that each hemisphere subserves and is particularly specialised for certain functions over the other hemisphere. The concept of lateralization was first propounded by the work of Broca and further strengthened by the work of Wernicke (Eggert and Wernicke, 1977). Both Broca and Wernicke identified distinct areas in the left hemisphere of the brain that subserve speech and language functions respectively. From their work it was estimated that between 70-95% of all individuals have a left-hemispheric language specialization (Eggert and Wernicke, 1977). They also noted that most of these individuals are right-handed, such that left-hemispheric language dominance is strongly correlated with right handedness. This association between handedness and its relative ability to predict brain lateralization was initially useful as a cheap, easy, and non-invasive pointer for academic researchers, medical clinicians and neurosurgeons to determine brain lateralization (Carpentier et al., 2001; Wallentin et al., 2014).

However, subsequent neuroimaging techniques and psychological tests have discovered, and continue to attribute, specific neurocognitive functions to either half of the brain. This is believed to be responsible for the desirability or otherwise of one half of the brain or the other, and thus association of either right handedness or left handedness with specific abilities.

2.4 Measurement of Handedness

Handedness, it has been argued, is a multidimensional trait rather than one-dimensional (Healey et al., 1986), such that several tests and methods are used in establishing handedness.

The best way of classifying subjects as right handed, left handed or ambidextrous remains controversial. Questionnaires of hand preferences and manual performance test are frequently used in literature, but both are associated with important limitations, complexities or even variability. Questionnaires of hand preferences are criticised for bias towards highly learned activities rather than towards spontaneous ones. Rigal (1992) has argued that it is preferable to use a battery for hand preference, in which subjects have to perform actual tasks. This may be more accurate than their answering to which hand they “think” they use more often to do one action or another, and would avoid the repetitive effect of questions and monotony of responses, gives a better idea of hand dominance. However, determining hand dominance by using performance on manual tasks is equally fraught with important limitations and complexities. In an exhaustive study by Barnsley and Rabinovitch (1970), 32 different tests were used for evaluation of hand efficiency in 177 individuals. Subsequent factor analysis of the results yielded nine different factors related to hand efficiency, namely, reaction time, dexterity, self-professed hand preference, wrist finger speed, aiming, hand stability, arm-movement stability, finger tapping, and grip strength (Barnsley and Rabinovitch, 1970). The difficulty in assigning differential weights to the factors and the

implausibility of combining scores on each test to produce a global hand-efficiency score has made performance test less utilized for determining hand dominance. Furthermore, self-professed hand dominance tends to correlate strongly with performance tests such that only a small percentage is misclassified when using questionnaires of hand preferences. For these reasons questionnaires of hand preferences are still widely used in determining hand dominance.

2.5 Causes of Left-Handedness

The exact cause or causes of handedness are unclear. Years of academic interest and neuropsychological research in this field continue to give inconclusive or even contradictory results. Firstly, it is not very clear whether handedness is a biological or sociocultural endowment, or what the relative contribution of each factor is in determining hand preference.

Secondly, though genetic inheritance is a likely biological factor underlying handedness the exact nature of this inheritance is unclear. Academic opinion ranges from a single gene theory to the currently dominant polygenic theory.

Still, other researchers argue that other extraneous factors like prenatal events are likely determinant of hand preferences.

2.6.1 Genetics

Family and twin studies give the best evidence for the role of genetics in handedness. Offspring whose parents are both left handed have a 26% chance of being left handed themselves (Medland et al., 2004). Coren and Porac (1980) analysed identical and fraternal twins between 1933 and

1985, and showed that only 76% of the expected 100% identical twins were concordant for handedness. Whilst the results showed that genetics is important in determining handedness, the incomplete concordance also implies that genetics is not the sole determinant of handedness in humans. The exact mode of this genetic inheritance had been extensively researched. McManus (1991) and Annett (1996) both hypothesized a single gene mode of inheritance. However the hypothesis has failed to explain the varying prevalence of left-handedness over time in a family.

Brandler et al (2013) and Bailey and McKeever (2004) recently are suggesting that the inheritance mode may well be polygenic as this will explain the variability of left handedness, and why the phenomenon is associated with several other conditions.

2.6.2 Prenatal events

Other prenatal events, mainly elevated level of maternal testosterone (Vuoksimaa et al., 2010), vestibular asymmetry at birth (Previc et al., 2014), and having had ultrasound screening while in-utero (Salvesen, 2011) are all said to be associated with left handedness.

2.7 Left and Right Handedness: Any differences?

The simplistic notion about differences in ability based on handedness arose from an important characteristic of the brain, functional specialization, as well as split brain studies conducted by neurosurgeons and neuropsychologists. Functional specialization is the phenomenon whereby the two hemispheres of the brain subserve different functions, despite their anatomic similarity. Most of the specific functions of each hemisphere of the brain came from split-brain studies, in which

the connecting neurons between the two hemispheres were surgically resected, and specific areas in each hemisphere were then stimulated with electrodes to observe the function they performed.

It was from studies of this nature that the idea of the left brain as being methodical and rational and the right brain being creative, intuitive and perceptual, originated. However, in real life scenarios, the interconnecting neuron between the cerebral hemispheres is intact and the two hemispheres function as a complete whole. It is virtually impossible to preferentially use either half of the brain to the exclusion of the other as both hemispheres continually exchange information via the corpus callosum.

2.7.1 Disorders

The left hander's brain has been recognised to be more symmetrical and less lateralized, and it has been argued that this may make the neuro-cellular architecture of the brain more complex, as well as increase susceptibility to developmental and neurodevelopmental abnormalities (Geschwind et al., 2002; Kalmady et al., 2013). Attention Deficit Hyperactivity Disorder, Intellectual Disability, Dyslexia, Autistic Spectrum Disorder, Stuttering, and Speech disorders are all said to be relatively commoner amongst left handers.

The LRRTM1 gene has also been linked to left handedness, suggesting a pathway whereby schizophrenia might be relatively commoner amongst left handers (Francks et al., 2007).

2.7 Sociocultural Beliefs, Religion and left-Handedness

It is probable that all this uncertainty and controversy about left-handedness and the sociocultural, religious and historical association of the word "left" with the ominous, has led to sociocultural

preference against the expression of left handedness. In Nigeria for instance, Bakare (1974) reported from research in South-western Nigeria that most men believed left-handedness occurs as a result of parents' laziness or carelessness in their child rearing practices. It is offensive to greet somebody or offer someone anything with the left hand. Dada (Dada, 2000) has noted several taboos around the left handed individual. Male left-handed children were never allowed to become kings even if they come from a royal family.

Payne (Payne, 1987) has argued that Left handed individuals are often stereotyped and discriminated against. The sociocultural biases against them include emotional and intellectual beliefs and prejudices, religious beliefs and social mores.

In most cultures in Africa, use of the left hand is seriously frowned upon and several communities actively discourage or suppress its use. Varied physical and psychological acts are often used, from name calling to corporal punishment and other extreme adverse acts (Dada, 2000)

2.8 Consequences of sociocultural pressures against left handedness

The "right-handed world" places some limitation on left-handers because most common tools and items are designed with right-hand persons in mind. In left-handed children and adolescents this is most obvious in classrooms where school desks may be unworkable and sitting arrangement with right handed colleagues problematic. Writing may be particularly difficult because the left-handed pupil has to pull the pen across the sheets, smudging ink in the process and making writing unreadable (Flatt, 2008). Suppression of the left hand is also associated with significant physical and psychological health challenges. Masud and Asir (2012) using interpretative phenomenological analysis in a qualitative study, identified several consequences resulting from

left-handed suppression to include conversion, physical pain, stammering, confusion, mental torture, personality damage, fear of devil, sensitivity, insecurity, uncomfortable feelings, suppressed personality, inferiority, depression and social anxiety.

In other studies, Johnson and Duke (1935) found a temporal relation between changes in handedness and the onset and disappearance of stuttering, whilst Tonnessen *et al* (1993) found that suppression of left-handedness was associated with dyslexia.

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Chapter Three

Methodology

3.1 Study Location

The study was conducted in Ibadan, the capital city of Oyo State in South West Nigeria. It is the second largest city in the country, with a population of over one and half million, representing about 2% of the total population of the country. Two local government areas, Ibadan North and Ibadan North-west, were selected for the study from the 5 local government areas in Ibadan.

Ibadan North Local Government Area covers an area of 145.58 km² (the largest land mass among the urban local government areas in Ibadan metropolis). Its estimated population from the 2006 census is about 387,053 inhabitants and an estimated annual growth rate of 3.27%. It consists of 12 wards and the headquarters is located at Agodi area.

Ibadan North-west Local Government Area was carved out of the defunct Ibadan Municipal Government in 1991. It covers a land area of 59.001km² with a population density of 3 persons per Km². Its estimated population is 173, 359, and administrative headquarter is located at Onireke. It has 11 wards.

A list of all the public secondary schools in the 2 local government areas was obtained from the Oyo State Ministry of Education. Out of the 35 public schools in Ibadan North Local Government and 32 public schools from Ibadan North West Local Government Area, 2 schools each were randomly selected.

Anglican Commercial Grammar School is a public school located in Ibadan North local government area. It is a co-educational school with 35 teachers and a student population of 1,781.

Oba Akinbiyi High School (I) is a public school also located within the Ibadan North local government area. It is co-educational, with 24 teachers and a student population of 1,086.

Oba Abass Aleshinloye Grammar school is the larger of the 2 schools located in Ibadan North West local government with a student population of 1,427. It is co-educational and has 34 teachers.

Jericho High School is also co-educational with a student population of 426. It has 20 teachers.

3.2 Study Design:

The study was a cross-sectional descriptive survey.

3.3 Study Population

Study participants were adolescents attending the 4 public schools selected for the study in the 2 local government areas.

3.3.1 Inclusion Criteria

1. Students between the ages of 10-19 years.
2. Students who are left handed as ascertained with the Edinburg Handedness Inventory.

3.4 Sample Size Calculation

Sample size for this study was calculated using the formula for estimating differences in 2 proportions:

$$N = \frac{(Z_{\alpha/2} + Z_{\beta})^2 * \{P_1(1 - P_1) + P_2(1 - P_2)\}}{(P_1 - P_2)^2}$$

Where;

N = sample size for each group

$Z_{\alpha/2}$ = the critical value of the Normal distribution at $\alpha/2$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96),

Z_{β} = the critical value of the Normal distribution at β (e.g. for a power of 80%, β is 0.2 and the critical value is 0.84)

P1 = expected proportion of depression in Left-handers. This was found to be 36% (Webb et al., 2013)

P2 = prevalence of depression – 10% (International Consortium of Psychiatric Epidemiology survey, 2006)

Computing the values;

N = 48 (approximated to 50 for one group; a total of 100 students for both the cohort Left Handers and the comparison non-Left-handers students.)

The number of students to screen to yield the estimated number of left handed cohorts is calculated using the formula

$$n = e / P_3$$

n = number of students to screen for left handed

e = estimated number of left handed cohorts required for the study

p = prevalence of left handedness in general population

Computing the values;

n = 50/6%

n = 834

3.5 Sampling technique

Stratified random sampling with proportional allocation was used for the study. The sample size of 875 was proportionally allocated to the 4 schools based on the school population to determine the sample size for each school. Using the class register obtained from the school principal, the number of study participants for each class and the sampling fraction for that class was determined. Finally, at each class, all the students present on the test administration day were numbered. Table of random numbers was used to randomly pick the first study participant and sampling fraction was used to recruit the required number for the class.

3.6 Study Instruments

Data was collected using 3 study instruments and a clinical interview.

3.6.1 A semi-structured Socio-demographics Questionnaire:

Sociodemographic questionnaire: This consisted of questions relating to sociodemographic characteristics adapted from a questionnaire used in a previous study on adolescents in rural and urban Ibadan (Omigbodun et al., 2008). It contains items such as age, gender, religion, family

background of the adolescent, such as familial history of left handedness, level of education and occupation of each parent (see Appendix 1).

3.6.2 Ascertainment of Left handedness: Edinburg Handedness Inventory (EHI)

Edinburg Handedness Inventory is a 10-item measurement scale created by Oldfield (Oldfield, 1971) and used to categorize the Handedness of individuals. Each item lists a particular activity and enquires about the hand the respondent prefers for carrying out that activity. Respondents indicated the hand (either right or left) they preferred for each of the 10 item-activity. A Laterality Quotient (LQ) was computed from the scores. Individuals with LQ score less than - 40 were categorize as left handed, whilst individuals with LQ score greater than + 40 were categorize as right handed, and Ambidextrous were those with LQ scores between -40 and +40. Edinburg Handedness Inventory has been extensively used and found to be a valid measure of hand preference. It has been used in Nigeria (Ademola et al., 2011) among medical students at the Lagos University Teaching Hospital.

3.6.3 Measures for Behavioural Problems:

Schedule for Affective Disorders and Schizophrenia for School Aged Children (6 – 18years)

-Present and Lifetime Version (K-SADS-PL) (Kaufman et al., 1997). K-SADS-PL is a semi-structured diagnostic interview designed to assess current and past episodes of psychopathology in children and adolescents according to the criteria of the fourth edition of the diagnostic and statistical manual of mental disorders (DSM-IV). It has three main sections.

The first section is an introductory interview which obtains information about the child's demographics, general health, hobbies, relationship and school functioning. This section was

excluded since similar questions, relevant to the objective of the study, have been included in the questionnaire above.

The second section is a diagnostic screening interview which surveys the primary symptoms of the psychiatric disorder (major Axis I diagnosis of DSM-IV). If the findings are not suggestive of psychopathology, no assessment beyond the screen interview is necessary. However, if positive symptoms are elicited, a supplemental symptom check-list is completed to assess the psychopathology in detail. The presence and severity of the symptoms are determined by combining the child's and parent's reports to achieve a summary rating. The researcher is not expected to recite all the probes verbatim or to use all the probes provided, but only as much as is necessary to arrive at a diagnosis. For this study only the child report was obtained.

The instrument has acceptable reliability and validity and has found widespread use in different cultural settings, including Nigeria (Abdulmalik et al., 2013; Gureje et al., 1994; Oladeji et al., 2011; Tunde-Ayinmode et al., 2012; Umar et al., 2015). The Yoruba version of the instrument has been used in South West Nigeria (Gureje et al., 1994).

3.6.4 Measure of socio-cultural pressure against left-handedness

A 3-item semi-structured questionnaire adapted from the Inventory of socio-cultural pressure against left-handedness (Zverev, 2006) was used to assess experience of pressure against use of left hand by the participants. The first question asks if anyone has persistently discouraged use of left hand in the participant, and the response options are either yes or no. The second question asks the participant to pick those that have persistently discouraged the use of the left hand from options that include parents, close relatives, teachers, church leaders, elders, and colleagues. The last question asks about what has been specifically done to the participant to discourage use of the left hand, and participants are required to choose as many as appropriate from a list of five options.

All items are provided with additional space for participant to input additional information that may not be reflected in the options provided (see Appendix 3).

3.6.5 Translation of the Instruments

The consent forms and questionnaires were translated into the local language (Yoruba), using the iterative back-translation procedure. This process was conducted by competent linguists at the University of Ibadan.

3.7 Ethical Consideration

3.7.1 Ethical Review and Approval

Ethical approval to carry out this study was obtained from the Oyo State Ethical Review Committee, Ministry of Health, Secretariat, Ibadan. Official permission was also obtained from the Oyo State Ministry of Education, and the authorities of the selected schools (see Appendix 4 and 5)

3.7.2 The Informed Consent Process

Written assent was sought and obtained from each individual participating student after explaining the aims and objectives of the study.

3.7.3 Confidentiality of data

All data collected from participants was kept confidential and used only for the purpose of this study. All identifying information was destroyed at the end of the study.

3.7.4 Beneficence to participants

A group health talk on mental health was given to all the participants, and those found to have any psychiatric illness were provided with psycho-education and further information on how to access treatment was also given. The findings from this study could provide the basis for future advocacy, prevention and intervention against socio-cultural pressures towards expression of left-handedness.

3.7.5 Non- maleficence to participants

This study poses no more than minimal risk to study participants and does not involve any invasive procedures. Furthermore, steps were taken to ensure that inconveniences are reduced to the barest minimum for the participants as a result of the interviews. This involved selecting periods and venues most convenient for the students in each school to participate in the study.

3.7.6 Right of Decline/Withdrawal from Study without Loss of Benefits

The autonomy of each participant was taken into account and efforts were made to ensure there was no perception of coercion to participate in the study. It was clearly stipulated that participation was free and voluntary and there will be no undue benefits such as favours from the researchers on account of participation. There were light refreshments served to the respondents after participating in the study, and during an interactive session following the questionnaire-administration process. No adverse consequences, deprivations, demotions or any other adverse effect were directed at those who choose not to participate, or who choose to withdraw from the study.

3.8 Study Procedure

At the first stage, 875 students proportionally allocated from the 4 schools were screened with the Edinburg Handedness Inventory. Using the class register obtained from the school principal, the number of study participants for each class and the sampling fraction for that class was determined. In each selected class, all the students present on the test administration day were numbered and the table of random numbers was used to randomly pick the first study participant. The sampling fraction was then followed until the required sample size for that class was met. For each left handed student two other students, matched for age and gender was then selected as comparison. Together, 159 students participated in the clinical assessment.

3.10 Data Analysis and Management

The data were cleaned and coded where appropriate and entered into a computer. Data entry and analysis was done using the statistical package for the social sciences version 22 (SPSS 20). The prevalence of psychiatric morbidity found and socio-demographic correlates were presented using descriptive statistics tool like frequency tables, means, proportion, and standard deviations. Group comparisons were made with the use of chi-square test for categorical variables. Fisher's exact test was utilized in cases where cells have small values that will not yield valid analysis with the chi-square test.

Chapter Four

Results

4.1 Introduction

This chapter is divided into four sections. Section one describes the sample and the socio-demographic characteristics of the study participants. The prevalence of left-handedness and comparison of the prevalence of psychiatric morbidity in left and right handed adolescents are presented in section two. Section three describes the pattern of sociocultural pressures against left-handedness as reported by the left-handed study group. The final section compares the prevalence of psychiatric morbidity of left handed students who reported being persistently discouraged from using the left hand and those who did not report this experience.

4.1.1: Sample description

A total of 875 students were proportionally sampled and screened in the first stage of the study from the four study centres (Fig. 1 and Table 1). From this sampled population, 53 students were ascertained to be left handed with scores on the Edinburg Handedness Inventory ranging from -40 to -100 and those students made up the study group. The comparison group was made of 106 right handed students, matched for age, gender and religion, selected from the right handed students in the sampled population. The 159 students comprising both the study and comparison group were then assessed for psychiatric morbidity in the second stage.

Fig. 1. Flow Chart

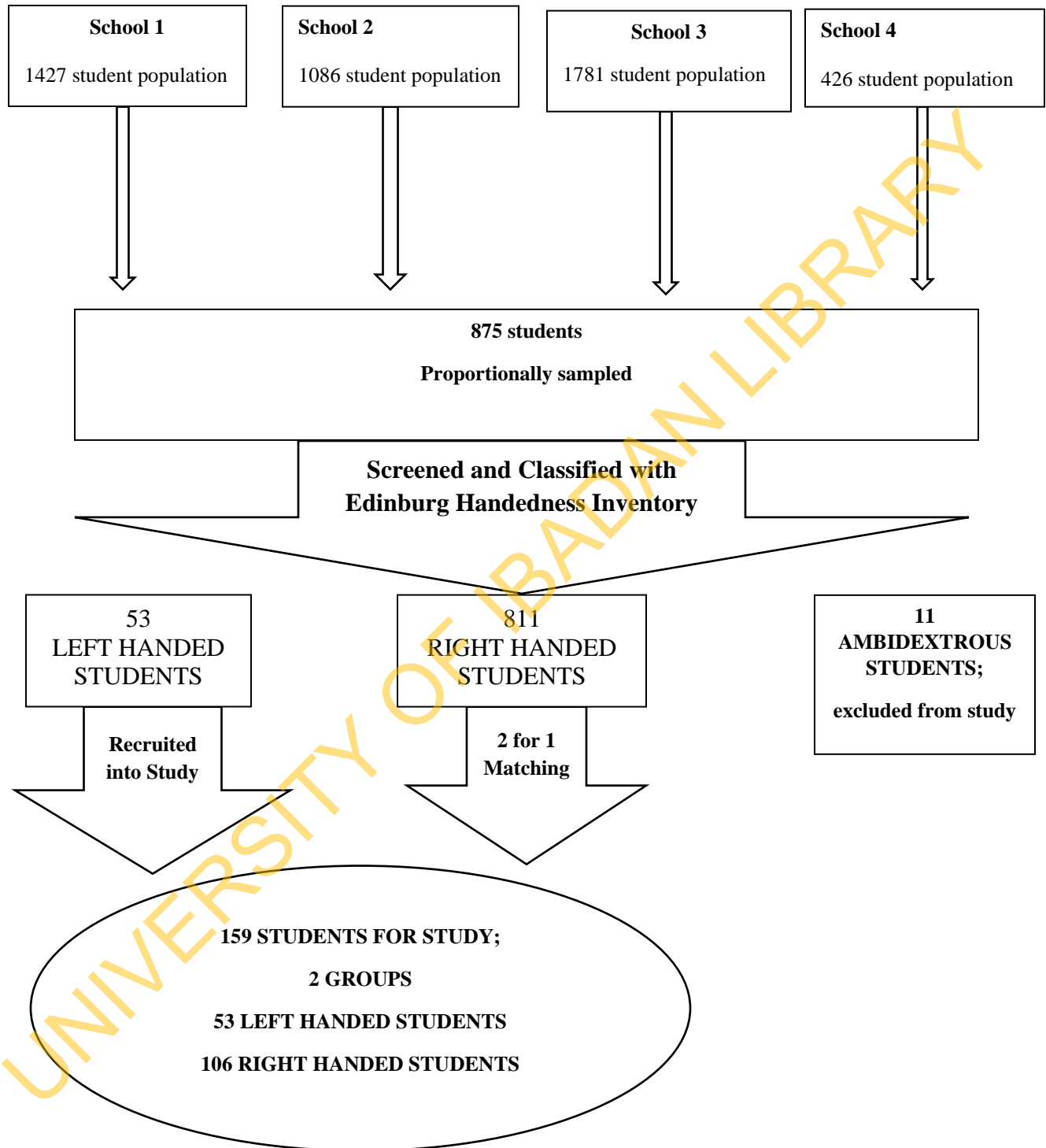


Table 1: Distribution and Proportional allocation in study centres

Schools	School population	Male	Female	Sampling fraction	Required sample	Sample	
						Male	Female
School 1	1427	746	681	0.3	263	137	126
School 2	1086	577	506	0.22	193	103	90
School 3	1781	935	846	0.38	333	176	157
School 4	426	145	281	0.1	86	30	56
Total	4720	2403	2314	1	875	286	429

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Table 2: Frequency distribution of Handedness; ascertained with the Edinburg Handedness Inventory among the 875 screened students.

N = 875

Handedness	Frequency (%)
Right handed	811 (92.7)
Left handed	53 (6.1)
Both hands(Ambidextrous)	11 (1.3)
Total	875 (100)

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4.1.2 Socio-demographic characteristics of study participants

875 students were screened from the 4 schools and their ages ranged from 10 to 18 years with a mean age of 14 ± 2.02 years. The females numbered 429 {N=875, (49%)} while 446 (51%) were males. The majority {N=875, (90.1%)} were from monogamous homes, of Yoruba ethnicity {N=875, (82.7%)}, Christians {N=875, (52.4%)} and right-handed {N=875, (92.7%)}. Only 351 {N=875, (40.1%)} indicated having at least one left-handed family member. From this sampled population, 159 students, comprising 53 left-handed students (study group) and 106 matched right-handed students (comparison group) were recruited into the study (Table 2).

Table 3 and Table 4 show the sociodemographic characteristics of the study group (left-handers) and the comparison group (right-handers). There were no statistically significant differences in sociodemographic characteristics of students in the two groups in terms of age, gender, family type, religion, parental level of education and occupation status, living circumstances and ethnicity. However, a greater proportion of students in the study group reported a family history of left-handedness {n=53, (62.3%)} as against {n=106, (34.9%)} in the comparison group. This difference was statistically significant ($p < 0.001$).

Table 3: Sociodemographic Characteristics of the Study (left-handers) and Comparison (right-handers) Group.

N =159					
Variables	Study Group n = 53 Frequency (%)	Comparison Group n = 106 Frequency (%)	TOTAL	χ^2	p-value
Age					
10 -14 years	26 (49.1)	71(67)	97 (61)	4.772	0.029 [^]
15 -18 years	27 (50.9)	35(33)	62 (39)		
Gender					
Female	24 45.3	48 45.3	72 45.3	0.000	1.000 [^]
Male	29 54.7	58 54.7	87 54.7		
Religion					
Islam	25 47.2	48 45.3	73 45.9	1.850	0.397 [^]
Christianity	25 47.2	56 45.3	81 50.9		
Traditional	3 5.6	2 1.9	5 3.2		
Ethnicity					
Yoruba	44 83	91 85.8	135 84.9	1.937	0.380
Igbo	5 9.4	12 11.3	17 10.7		
Hausa	4 7.5	3 2.8	7 4.4		
Family type					
Monogamous	43 87.4	96 90.6	139 87.4	2.860	0.091
polygamous	10 27	10 9.4	20 12.6		
Marital status					
Married	42	90	132	2.949	0.566
Others*	11	16	27		
Living Circumstances					
With parents	38 71.7	81 76.4	119 74.8	4.341	0.631
With others**	15 28.3	25 23.6	40 25.2		

* Others include separated/divorced, single orphan and double orphan

** Others include either parent alone, grandparents, or other family members.

[^] Study group and comparison group matched on age, gender and religion

Table 3 CONTD: Sociodemographic Characteristics of the Study (left-handers) and Comparison (right-handers) Group.

N = 153					
Variables	Left-handers Study Group n = 53 Frequency (%)	Right-handers Comparison Group n = 106 Frequency (%)	TOTAL	x ²	p-value
Upbringing					
by:					
Parents	39	86	125	4.190	0.522
others	14	20	34		
Father's Education					
No Formal education	10	8	18	4.702	0.319
Primary	6	15	21		
Secondary	26	56	82		
Tertiary	9	23	32		
I Don't Know	2	4	6		
Mother's Education					
No Formal education	4	7	11	1.365	0.850
Primary	3	11	14		
Secondary	36	66	102		
Tertiary	17	7	24		
I Don't Know	3	5	8		
Fathers Occupation					
Employed	40	93	133	3.885	0.049*
Not provided	13	13	26		
Mothers occupation					
Employed	45	104	149	10.458	0.001*
Not provided	8	2	10		
Familial left handedness					
Yes	33	37	70	10.732	0.001
No	20	69	89		

Table 4: Sociodemographic Characteristics [age] of the Study (left-handers) and Comparison (right-handers) Group

N= 153

Variables	Left-handers	Right-handers	t-test	95% C.I of difference			p-value
	Study Group n = 53	Comparison Group n = 106		Lower	upper	df	
	Mean (SD)	Mean (SD)					
Age	14.47 (1.72)	13.67 (1.81)	-2.680	-1.393	0.211	157	0.008

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4.2 Prevalence of Left-handedness

The prevalence of left-handedness among the population of screened students was 6.1%

(Table 2).

4.2.1 Prevalence and correlates of psychiatric disorders in study and comparison group

4.2.2 Prevalence of psychiatric disorders in the study group

Table 5 shows the lifetime prevalence rates of psychiatric disorders in the two study groups. The overall prevalence rate for any psychiatric disorder in the left-handed group was {N=53, 37.7%}. When classified as internalising or externalising disorders, {N=53, 28.3%} of students in the study group had internalising disorders and only {N=53, 9.4%} of the same group of students had externalising disorders. Broadly, the disorders for the study group were mood disorders {N=53, (13.2%)}, anxiety disorders {N=53, (15.1%)} and others, including psychotic disorder, alcohol abuse, attention deficit and hyperactivity disorder (ADHD), conduct disorder (CD) and oppositional defiant disorder (ODD) {N=53, (9.4%)}. In terms of specific diagnosis, depressive disorders and generalized anxiety disorder had the highest prevalence {N=53, (7.5%)}, followed by dysthymia {N=53, (5.7%)} and specific phobia and social phobias {N=53, (3.8%)}. The prevalence of ADHD, ODD, and CD were each {N=53, 2%}, while that of psychotic disorders and alcohol abuse were {N=53, 1%}.

Table 5: Prevalence of Psychiatric Morbidity among (Left Handers) Study Group

N=53		
Variables	Frequency	percentage
Psychiatric morbidity		
Disordered	20	37.7
Not disordered	33	62.3
Total	53	100
Type of diagnosis		
Internalizing	15	28.3
Externalising*	5	9.4
Not disordered	33	62.3
Total	53	100
Broad category		
Mood disorders	7	13.2
Anxiety disorders	8	15.1
Others	5	9.4
Not disordered	33	62.3
Total	53	100
Specific diagnosis		
Depression	4	7.5
Dysthymia	3	5.7
Generalized anxiety disorder	4	7.6
Specific phobia	2	3.8
Social phobia	2	3.8
Attention deficit/hyperactivity disorder	1	1.9
Oppositional defiant disorder	1	1.9
Conduct disorder	1	1.9
Psychotic disorder	1	1.9
Not disordered	33	62.3
Total	53	100

*includes Psychotic disorder, Alcohol abuse

4.2.3 Prevalence of psychiatric disorders in the comparison group

Table 6 shows the lifetime prevalence rates of psychiatric disorders in the comparison groups. The overall prevalence rate for any psychiatric disorder in this group was {N=106, 22.6%}. When classified as internalising or externalising disorders, {N=106, 17%} of students in the comparison group had internalising disorders and only {N=106, 5.7%} of the same group of students had externalising disorder. Broadly, the disorders for the comparison group were mood disorders {N=106, (10.4%)}, anxiety disorders {N=106, (7.5%)} and others -psychotic disorder, alcohol abuse, Attention deficit and hyperactivity disorder (ADHD), conduct disorder (CD) and oppositional defiant disorder (ODD) {N=106, (4.7%)}. In terms of specific diagnosis, Depressive disorders had the highest prevalence {N=106, (6.6%)}. Similar prevalence was observed for Dysthymia and Generalized Anxiety disorder {N=106, (3.8%)}. Specific and Social phobia, and Conduct disorder had {N=106, 2%} prevalence rate while alcohol abuse, ADHD and ODD were {N=106, 1%}.

Table 6: Prevalence of Psychiatric Morbidity among (right handers) comparison group

N=106

Variables	Frequency	Percentage
Psychiatric morbidity		
Disordered	24	22.6
Not disordered	82	77.4
Total	106	100
Type of diagnosis		
Internalizing	18	17.0
Externalising*	6	5.6
Not disordered	82	77.4
Total	106	100
Broad category		
Mood disorders	11	13.2
Anxiety disorders	8	15.1
Others	5	9.4
Not disordered	82	77.4
Total	106	100
Specific diagnosis		
Depression	4	7.5
Dysthymia	3	5.7
Generalized anxiety disorder	4	7.6
Specific phobia	2	3.8
Social phobia	2	3.8
Attention deficit/ hyperactivity disorder	1	1.9
Oppositional defiant disorder	1	1.9
Conduct disorder	1	1.9
Psychotic disorder	1	1.9
Not disordered	82	77.4
Total	106	100

*Includes Psychotic disorder, Alcohol abuse

4.2.4 Comparing prevalence of psychiatric morbidity between the study and comparison group
Bivariate analysis using chi-square as a test of significance showed valid statistically significant difference between the prevalence of **any** psychiatric disorder ($\chi^2=4.022$, $p=0.045$) when the two groups were compared. Among the left-handed participants, {N=53, 66.7% } had any psychiatric disorder, while {N=53, 22.6% } of right-handed participants had any psychiatric disorder. While differences existed between the other diagnoses, they were not statistically significant (Table 7).

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Table 7: Comparing Prevalence of Psychiatric Morbidity between Study and Comparison Group

Disorders	Left-Group	Right-Group	Statistic	
	n=53	n=106	x ² -value	p-value
	Frequency (%)	Frequency (%)		
Any Psychiatric disorder				
No	33 (43.4)	82 (77.4)	4.022	0.045
Yes	20 (66.6)	24 (22.6)		
Total	53 (100.0)	106 (100.0)		
Type of disorder				
Internalizing	15 (75.0)	18 (75)	4.022	0.134
Externalizing	5 (25.0)	6 (25)		
Total	20 (100.0)	24 (100.0)		
psychiatric disorders				
Mood disorders	7 (35.0)	11 (45.8)	0.530	0.767
Anxiety disorders	8 (40.0)	8 (33.4)		
Others	5 (25.0)	5 (20.8)		
Total	20 (100.0)	24 (100.0)		

4.3 Sociodemographic correlates of psychiatric morbidity among the study and comparison group

Table 8 showed the result of bivariate analysis using chi-square as test of significance. In the overall sample, females were more likely to have a psychiatric disorder compared with males. This difference was statistically significant ($\chi^2=4.6381$, $p=0.030$, $OR=2.1645$). While this likelihood was observed in both groups, it did not reach statistical significance in the study group.

Handedness was also associated with presence or absence of psychiatric disorder. Left handed students were more likely to have a psychiatric diagnosis ($\chi^2=4.022$, $p=0.045$, $OR=2.071$). Whether the students reported being persistently discouraged against use of the left hand was also associated with presence of any psychiatric disorder in the respondents ($\chi^2=8.798$, $p=0.003$, $OR=33.435$). No other sociodemographic variables showed any statistically significant relationship with presence of psychiatric diagnoses.

Table 8: Statistically Significant Sociodemographic Correlates of Psychiatric Diagnoses

N = 159

variables	Gender	Any psychiatric diagnosis		df	x ² -value	p-value
		No	Yes			
Gender	Male	69	18	1	4.6381	0.030
	Female	46	26			
Left handedness	Yes	33	20	1	4.022	0.045
	No	82	24			
Report of being “persistently discouraged against use of left hand”	Yes	23	19	1	8.798	0.003
	No	92	25			

*significant

The statistically significant independent variables on bivariate analysis namely; gender, left handedness and report of being persistently discouraged against use of left hand were entered into logistic regression to determine the relative contribution of each variable to the presence of any psychiatric disorder. Only gender and report of being “persistently discouraged against use of the left hand” were independently statistically significant (OR=2.288, 95% CI= 1.098 – 4.768 and OR=8.809, 95%CI= 1.012 – 76.679). (Table 9).

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Table 9 Binary logistic regression of the variables associated with the presence of psychiatric disorders in the study and comparison group

Variables	Beta	OR	P-value	95% CI
Gender*	0.828	2.288	0.027	1.098 – 4.769
Left handedness	1.099	3.00	0.310	0.360 – 25.020
Reported being “persistently pressured against use of left hand”	2.176	8.809	0.049	1.012 – 76.679

*Female gender

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4.4: Comparison of prevalence of psychiatric morbidity in the study group among those who reported being persistently discouraged against use of left hand and those who do not report this experience.

Table 10 showed that left handed students who reported being persistently discouraged were likely to have higher prevalence of any psychiatric morbidity (35.8%) compared with those who did not report being persistently discouraged (2%). Bivariate analysis showed that this difference in rate was statistically significant ($\chi^2=4.848$, $p=0.028$). Being persistently discouraged did not show any statistically significant relationship to type, broad class and any other specific diagnosis.

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Table 10 Comparison of Prevalence of Psychiatric Morbidity among those who reported being persistently discouraged and those who do not

Study group (left handed students)					
N = 53					
Diagnosis		Reported persistent discouragement n=42	Did not reported persistent discouragement n=11	x ²	p- value
Any psychiatric diagnosis					
	Yes	19	1	4.848	0.028
	No	23	10		
Type of diagnosis					
	Internalising	15	0	5.760	0.056
	externalising	4	1		
Broad class of diagnosis					
	Mood disorders	7	0	3.158	.206
	Anxiety disorders	8	0		
	others	4	1		

4.5 Pattern of sociocultural pressure against expression of left handedness.

Of the 53 left-handed students, 42 students {N=53, (79.2%)} reported being persistently discouraged against using the left hand, and this was done in majority of instances by the parents {N=42, (43%)}, followed by Teachers {N=42, (21%)}, and family members {N=42, (17%)}. Elders in religious setting and colleagues were reported as being responsible in {N=43, 7 (16.7%)} and 3 (7.1%) respectively. Students reported either being simply “told to change hands” or “being scolded or abuse” as the most common means to persistently discouraged them from using the left hand {N=42, (33%)}. About {N=42, 24% } of the students reported being punished or beaten to persistently discourage the use of the left hand, while {N=42, 7% } reported being denied gift or food items (Tables 11 and 12).

Table 11 **Frequency distribution for category of persons who persistently discourage respondents**

N= 42

Persons	Frequency (%)
Parents	18 (42.9)
Teachers	9 (21.4)
Elders in religious settings	5 (11.9)
Others (family member)	7 (16.7)
Colleagues	3 (7.1)

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Table 12 **Common methods used to discourage respondents against use of left hand**

N=42

What was done:	Frequency (%)
“..was told to change hands”	18 (42.9)
“..was scolded or abused”	9 (21.4)
“..was denied gift item or food”	5 (11.9)
“..was punished or beaten”	3 (7.1)

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Chapter Five

Discussion, Conclusions and Recommendations

This study broadly aimed to determine the prevalence of left handedness in the student population and to describe common psychiatric disorders in left handed adolescents. Specific objectives were to compare prevalence and correlates of psychiatric disorders in the left hand group with the right hand group. In addition, the study sought to describe the pattern of socio-cultural pressures against expression of left handedness as reported by the left handed students, and to determine if those pressures might be risk factors independently associated with psychiatric disorders.

Sociodemographic characteristics of study participants

Over 800 students from 4 public schools in Ibadan North and Ibadan North-west local government area were screened. The sociodemographic characteristic of the participants in this study group are similar to the sociodemographic characteristic of school adolescents in previous studies from this sub-region of the country (Adewuya and Ologun, 2006; Omigbodun, 2008). Participants were in the senior secondary class, had a mean age of 14 years, were predominantly of Christian religion, had both their parents currently married, and were from monogamous homes. This significantly mirrors the demographic profile of families in this sub-region who are mostly Christians, monogamous, and married (National Population Commission (NPC), 2009).

A one-for-two matching of left handed students with right handed students was done to minimise possible confounding factors, therefore, the 2 groups were comparable in terms of age, gender and religion. It was especially important to match for these factors because of their potential mediating effect on the experience of persistent discouragement against use of the left hand in left handed adolescents. Though the students could not be matched *a priori* for level of parental education, the

result showed that the students did not differ significantly on this variable. Increasing level of awareness and education in parents about left handedness being a safe variant of normal handedness is believed to be key to influencing the desirability or otherwise of left handedness (Uwaezuoke et al., 2015).

For the aforementioned reason, both the study and comparison group were comparable and there were no statistically significant differences on the aforementioned variables.

Prevalence of left handedness

The prevalence of left handedness found in the population studied was 6.1%. This is smaller than the 8-11% often reported globally for handedness. This prevalence is comparable to the findings of (Enmore et al., 2008; Uwaezuoke et al., 2015), and falls within the range reported across several studies conducted in various communities (Raymond and Pontier, 2004; Faurie et al., 2005). In Nigeria, Uwaezeoke and others (2015) have theorized that the upward trend in the prevalence of handedness observed in several of these studies is due to increasing westernization and awareness. However it is still surprising that the observed prevalence in this study appears to be closer only to the lower limit of prevalence values globally. One may have expected our observed prevalence to be higher if this upward trend were to be preserved in the contemporary Nigerian context, particularly in South-west Nigeria where our study was conducted. The relatively lower prevalence was probably due to differences in the method used for ascertaining left handedness, compared to other studies. The differences may also be reflective of actual differences in populations studied. Lastly, it may well be that the attitudes toward left-handedness may be changing in Nigerian society.

The age distribution of the left handed showed approximately equal percentage (49.1% vs 50%) for both the age group 10 – 14year and 15 – 18years. However, majority of the left handed students were aged 13years and above, with only 24.5% of them being aged 12years and below. One explanation for this finding may be that whilst attempts to suppress left-handed expression may begin at an early age, the likelihood of a successful switch from left-handedness to right-handedness may decrease with age.

Familial history of left handedness was higher in the left hand group compared with the right handed group, and parents were often the identified left-handed family member. This observation agrees with the view on left handedness as being genetically mediated with incomplete penetrance (McManus, 1991).

Common psychiatric disorders in the study sample

More than a third (37.7%) of the left handed students and less than a quarter (22.6%) of the right-handed group had at least a psychiatric diagnosis at the time of the study. In the overall sample, we identified 44 adolescents out of 159 as having any psychiatric disorder, a prevalence of 26.7%. Predominant among the identified disorders were mood and anxiety disorders, a pattern similar to that reported among children and adolescents in general populations around the world (Merikangas et al., 2009; Polanczyk et al., 2015). These findings also correspond with a few studies conducted among Nigerian youth populations. For instance, in an early study, Gureje, Omigbodun and others assessed children attending a paediatric primary care clinic in South-West Nigeria using the parents' version of the Rutter scale and the KSADS. Out of an almost 20% prevalence of DSM-III-R diagnoses in that study, the most common disorders identified were depression and anxiety disorders in 6% and 4.7% of the children respectively (Gureje et al., 1994).

Comparison of prevalence of psychiatric disorders between left and right handed students.

The bivariate analysis showed that left handed students were more likely to have a psychiatric disorder when compared with the right handed group. There was a one in 3 chance of having a psychiatric disorder among the left handed group compared with 1 in 5 for the right handed group. Although the specific diagnosis were too few to perform a valid statistical analysis, our general study findings correspond with those of a number of studies in other regions. In a prospective cohort study of Dutch adolescents, non-right-handed youth were reported to experience significantly more thought problems, social problems, and being withdrawn and depressed, compared to right-handed youth (van der Hoorn et al., 2010). Similarly, in a case cohort study of children treated at an urban-based mental health centre in Baltimore, United States, psychiatric diagnoses were significantly more commonly made among left-handed, than right-handed children (Logue et al., 2015). In this study, left-handers had 70% increased odds of anxiety disorder, 53% increased odds of depression, and 78% increased odds of oppositional defiant disorder. The rates of psychiatric disorder among left-handed children in this clinic setting may have been higher than those found in our study because of the difference in study samples. Our study reviewed secondary school students who are generally not recognised as a high risk group, and this may account for the difference.

Correlates of psychiatric morbidity

Three variables were found to be associated with presence of any psychiatric disorder. Using the unadjusted odds ratio, females in the entire sample were twice as likely to have any psychiatric disorder compared to their male counterparts. Also, students who reported persistent

discouragement against the use of left hand were more than 30 times more likely to have any psychiatric disorder.

Following binary logistic regression, we found that females continued to be twice as likely to have psychiatric disorder. Similarly, reporting being persistently discouraged against the use of the left hand was still independently associated with having a psychiatric diagnosis. Left handed students who reported this experience were 8 times more likely to have a psychiatric diagnosis than other students who did not report this experience. On the other hand, the likelihood that left handedness was independently associated with a psychiatric diagnosis was not statistically significant. This finding suggests that it is not being left handed *per se* that is associated with a psychiatric diagnosis, but rather, the experience of persistent discouragement against the use of the left hand. A similar finding and conclusion was reached in a study on psychological and physical well-being and cognitive performance in a sample of older adults (Porac and Searleman, 2002).

Pattern of socio-cultural pressure against left handedness

Majority of the left handed students reported being persistently pressured against using their dominant left hand. This reflects the prevailing sociocultural and religious attitudes towards left handedness (Adeoye and Dada, 2004; Zverev, 2006; Uwaezuoke et al., 2015).

It is intuitive that parents and teachers may be the primary agents responsible for pressuring adolescents to suppress the use of the left hand, and this was supported by our study findings. Majority of the students endorsed parents and teachers as being mostly responsible for persistently discouraging the use of left hand, out of a list of three other groups of individuals that included other family members, religious leaders and colleagues. This is similar to the finding by Zverev (2006) in a community study on cultural and environmental pressure against left-handed

preference in Malawi. In that study, majority of respondents, who included a broad range of adults in the community, had a negative view on left hand preference, and nearly all respondents considered that left handers should be forced to change to the right hand. Parents and teachers were found to be the dominant group responsible for this views and attempts (Zverev, 2006).

The use of extreme methods such as punishment and denying food or other gift items to discourage the use of the left hand was reported by up to a third of the students, while majority reported either being told to change or being scolded for using the left hand. There was no association between sociodemographic variables and these patterns of sociocultural pressure.

Conclusions and Recommendation

In conclusion, this study showed a significantly higher prevalence of psychiatric disorders among left-handed adolescents, compared to right-handed adolescents attending schools in the same region of South-West Nigeria. The study also revealed that the association between left handedness and psychiatric morbidity may be due to the experience of persistent discouragement against the use of the left hand (switch attempts), rather than merely being left handed. In addition, the study documents a relatively low prevalence rate of left handedness among the secondary school students studied. This suggests continuing low preference for the use of the left hand in the South-West Nigerian society, with persistence of the use of punitive psychosocial practices to attempt to shift the sinistrality of adolescents in this region. While these practices are often successful, they may be constitute risk factors for significant psychiatric morbidity.

Lastly, our study documents the common patterns employed to suppress the use of the left hand by children and adolescents in an urban South-West Nigerian society, as well the individuals who most commonly employ these practices. This information is especially important as it highlights

important groups of stakeholders and relevant target practices which should constitute the focus of intervention efforts designed to address these issues.

A strength of this study is that to the best of the knowledge of the investigator, it is one of the first to demonstrate an association between sociocultural pressures to change handedness from left to right in children or adolescents, and the presence of psychiatric morbidity, in a sub-Saharan African community.

The following limitations were encountered in the course of the study:

1. All data were obtained by student self-report and diagnoses were made without the parent version of the KSADS
2. Cognitive functioning, dyslexia and stuttering, all thought to be commoner in left handed population were not assessed due to limitations in the diagnostic instrument used.
3. The small sample size of left handed students precluded analysis of specific diagnosis.

Notwithstanding these limitations, this study provides evidence regarding the presence and pattern of psychiatric morbidity associated with forced sinistrality in South West Nigeria, and provides a template for future research in this area.

The results of this study show that females, even at the secondary school level, are at elevated risk of psychiatric morbidity, and that adverse psychosocial reactions towards left handedness contribute more to the development of psychiatric morbidity than left handedness itself. Based on these, the following recommendations are made for clinical, policy and research purposes:

1. There is a need for continued advocacy towards policy makers in health, education, school authorities, religious and community leaders to dissuade the pattern of suppressing expression of the left hand.
2. Future studies should focus on special populations like special education homes and autistic centres where children with developmental disorders, largely absent in mainstream schools, may receive academic instruction. This can further explore the relationship between left handedness and those disorders.
3. There is a need for strategies to bolster the mental health of secondary school students, especially for female adolescents.

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Chapter Six

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Appendix 1

Informed consent (Adolescent)

Title of research:

**LEFT HANDEDNESS AND ASSOCIATED PSYCHOSOCIAL CORRELATES
AMONGST SECONDARY SCHOOL STUDENTS IN IBADAN, NIGERIA.**

This study is being conducted by Dr. Kehinde Lawal, an Msc student of the Center for Child and Adolescent Mental Health, University of Ibadan, Nigeria. The purpose of the research is to determine the effects of several social practices on your well-being.

The study will involve asking you about your experiences and inquiring about any associated difficulties. All information obtained will be kept confidential and use for research purpose only. All information collected in this study will be given code numbers and no name will be recorded. This cannot be linked to you in any way and your name or any identifier will not be used in any publication or reports from this study.

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. If you choose not to participate, this will have no effect on you or your education. Only light refreshments (Sweets) and pens to fill the questionnaires will be provided. You do not have to take part in this research if they do not wish to do so. You may stop participating at any time that you wish.

Statement of person giving consent: Now that the study has been well explained to me and I fully understand the nature and purpose of the study, I will be willing to take part in the study

Signature/ thumbprint of participant: _____

Date _____

Name: _____

Appendix 2

SOCIO-DEMOGRAPHIC QUESTIONNAIRE IN ENGLISH & YORUBA

1. How old are you? Omo odun melo ni o? ____

2 Are you a boy or a girl? (a) boy (b) girl

2 Şe okunrin tabi obinrin? (a) Okunrin (b) Obinrin

3. Please mark the exact place you attend for worship

3 Kọ ibi ti o ti maa njosin

(a) Islam (b) Orthodox Christian (c) Pentecostal Christian (d) Traditional religion (e) Other

4. Family Type:

4. Iru ebi:

(a) Monogamous (b) Polygamous

(a) Oniyawo kan (b) Oniyawo meji tabi ju beelo

5. how many brothers and sisters do you have in total? _____

5. Me lo ni iwo ati awon egbon ati aburo re lo okunrin ati lo obirin?

6. Marital Status of Parents:

6. Ibagbeo awon obi re:

(a) Married (b) Separated/Divorced (c) Father is dead (d) Mother is dead (e) Mother & Father are dead

(a) Şe won gbe po? (b) Şe won ti ko ra won silẹ? (c) Baba ti ku (d) Iya ti ku (e) Iya ati Baba ti ku

7. Who do you live with presently?

7. Tani o n gbe pelu lowolowo?

(a) Parents (b) Mother (c) Father (d) Grandparent (e) Grandmother

(a) Awon obi (b) Iya nikan (c) Baba nikan (d) Iya ati Baba Agba (e) Iya Agba nikan

(f) Grandfather (g) Other [please specify] _____

(f) Baba Agba nikan (g) Awon Iyoku [Jowo so nipato] _____

8. Who brought you up from your childhood?

8. Talo to e dagba lati kekere?

(a) Parents (b) Mother (c) Father (d) Grandparent (e) Grandmother (f) other relatives

(a) Awon obi (b) Iya nikan (c) Baba nikan (d) Iya ati Baba Agba (e) Iya Agba nikan

(f) Grandfather (g) Other [please specify] _____

(f) Baba Agba nikan (g) Awon Iyoku [Jowo so nipato] _____

9. How many different people have you left your parents to live with from your childhood? ____

9. Awon eniyan ototo melo ni o fi awon obi re silẹ lati lo gbe pelu won? ____

10. Do you do any kind of work to earn money before or after school? Yes No

10. Njẹ o maa nṣiṣe lati ri owo lẹhin tabi saaju ki o to lo si ile iwe? (Bẹni tabi bẹkọ)

11. If yes, please describe what you do _____

11. Ti o ba je bẹni, ẹ alaaye ohun ti o ẹ _____

12. Level of Father's Education

12. Iwe melo ni baba ẹ ka?

(a) No Formal Education (b) Koranic School (c) Primary School (d) Secondary school

(a) Ko kawẹ rara (b) Ile-keu (c) Ile-Iwe Alakọbẹ ẹ (d) Ile iwe girama

(e) Post-Secondary (Non-University) (f) University Degree and above (e) I do not know

(e) Ile-iwe agba (Yatọ fun yunifasiti) (f) Yunifasiti ati ju bẹ ẹ (e) Nko mo

13. Occupation of Father: [Write the exact occupation] _____ I do not know

13. Iṣe wo ni Baba ẹ n ẹ: [Kọ iṣe ti wọn nṣe pato lẹkunrẹ ẹ] _____ /Nko mo

14. Level of Mother's Education

(a) No Formal Education (b) Koranic School (c) Primary School (d) Secondary School

(a) Ko kawẹ rara (b) Ile-keu (c) Ile-Iwe Alakọbẹ ẹ (d) Ile iwe girama

(e) Post-Secondary (Non-University) (f) University Degree and above (e) I do not know

(e) Ile-iwe agba (Yatọ fun yunifasiti) (f) Yunifasiti ati ju bẹ ẹ (e) Nko mo

15. Occupation of Mother: [Write in the exact occupation] _____ / I do not know

15. Iṣe wo ni iya ẹ nṣe: [Kọ iṣe ti wọn nṣe pato lẹkunrẹ ẹ] _____

16. Do you have any family member that uses the Left Hand? _____

16. Se enikankan ni idile re ma n lo owo osi?

17. If yes pls specify who:

17. Ta ni o ma n lo owo osi ni idile re:

Appendix 3 Edinburgh Handedness Inventory

Your participant ID: _____

Please indicate with a one (1) your preference in using your left or right hand in the following tasks.

Where the preference is so strong you would never use the other hand, unless absolutely forced to, put a two (2).

If you are indifferent, put a one in each column (1 | 1).

Some of the activities require both hands. In these cases, the part of the task or object for which hand preference is wanted is indicated in parentheses.

Task / Object	Left Hand	Right Hand
1. Writing		
2. Drawing		
3. Throwing		
4. Scissors		
5. Toothbrush		
6. Knife (without fork)		
7. Spoon		
8. Broom (upper hand)		
9. Striking a Match (match)		
10. Opening a Box (lid)		
Total checks:		
Which foot do you prefer to kick with?		
Which eye do you use when using only one?		

Appendix 4

Serial ID _____

Questionnaire on experience of Left Handedness

Please place a Tick in the appropriate response box. You can write additional comment in space below.

No	Question	Options	Response
1	Has anyone persistently discouraged you or stop you from using Left Hand?	Yes	
		No	
2	Who has persistently discouraged you or stop you from using Left Hand?	Parents	
		Teachers	
		Elders (In Churches/Mosques)	
		Colleagues	
		Family members	
		Others (give examples)	
3	What has been done to discouraged you or stop you from using Left hand	Told to change every time I use Left Hand	
		Scolded/abused/ every time I use Left Hand	
		Denied gift or food every time I use Left Hand	
		Punished or Beaten every time I use Left Hand	
		Others (give examples)	

Appendix 5
Kiddie-Schedule for Affective Disorders and Schizophrenia

SYMPTOMS	CURRENT RATING	PAST RATING	SYMPTOMS	CURRENT RATING	PAST RATING	SYMPTOMS	CURRENT RATING	PAST RATING
Depressive Disorders			Generalized Anxiety Disorder			tics		
						substance		
			Obsessive Compulsive Disorders					
						Alcohol		
			Enuresis and Encopresis					
Mania								
			Eating					
						Substance use		
Psychosis						ca		
						st		
						Sed		
						C		
Anxiety Disorders- Panic			Attention			O		
						P		
						H		
						S		
			oppositional			O		
						ptsd		
Avoidant/Social Phobia								
			Conduct					
Agoraphobia and Specific Disorders								

Name:

Serial Id

Code:

SYMPTOMS	Current Rating	Past Rating	SYMPTOMS	Current Rating	Past Rating			
Recurrent thoughts or image			Repetitive play					
Avoidance behaviours against thoughts, feelings associated with trauma			Dissociative episodes					
			Illusions					
			Hallucinations					
			Distress to similar exposures					
			Avoidance behaviours					
			Disorganized memory of events					
			Diminished interest since occurrence					
			Detached or estranged feelings					
			Restricted affect					
			Sense of foreshortened future					
			Difficulty concentrating					
			Nightmares			Hyper vigilance		
			Insomnia			Exaggerated startled response		
Irritability			Physiological reactions to symbolic events.					
			Impairment Social					
			Impairment Family					
			Impairment School					
			DSM IV CRITERIA					

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