**Applications of Statistical Hypothesis Testing**

Statistical hypothesis testing can be applied to various fields and areas. The applications here come from medicine, personality, and psychology.

1. **Medicine**

* **The Objective of Study**

The study was conducted to investigate the association between watching television (TV) and obesity among school children in the Saudi Arabia.

* **Data**

The data were collected from students in the age of 9 to 14 years old who had visited the school health clinic in King Abdulaziz Housing for National Guard (Iskan), Riyadh, Saudi Arabia from February 2012 to April 2012.

As the study was designed as a case-control study, the cases were obese students while the controls were non-obese students. The data was collected every day during the period of study. Each day, 10 students which included 5 obese students and 5 non-obese students were selected to participate in the study. The participants were required to answer a 20-item Arabic questionnaire. The information obtained from the children were demographic data, TV watching, physical activity, meals, and anthropometric measurements.

At last, 397 students between 11 and 14 years were interviewed and around half of the students interviewed were boys (50.6%).

* **Methodology**

The study was designed as a case-control study. A large number of cross‐sectional surveys with a smaller number of longitudinal surveys were used in this study.

The data collected were analyzed by using the Statistical Package for Social Sciences (SPSS) software version 18.0. Chi-Square tests (χ2) were used to check for the association between two categories variables. *P* values were also calculated to determine the statistical significance. Lastly, the logistic regression analysis was performed to evaluate the causes of obesity.

The categories tested are listed below:

1. The association between age, gender, and BMI.
2. The relation between BMI and watching TV.
3. The relation between BMI and number of diet.
4. The association between BMI and parents’ feelings about amount of TV their child watches.
5. The relation between BMI and the rate of exercising.
6. Logistic regression analysis of risk factors for childhood obesity.

* **Result**

Based on the analysis, watching TV during childhood was shown as a factor of causing obesity. An increase in the child’s age (*P* = 0.003), presence of more than one TV at home (*P* < 0.001), child having his own TV (*P* = 0.002), and an increase in hours of watching TV (*P* = 0.009) were significantly associated with the childhood obesity.

1. **Personality**

* **The Objective of Study**

The purpose of this study is to investigate the association between sex differences and intelligence. It was interested in testing the Lynn’s (1994) hypothesis that the average intelligence of males is higher than females after the age of 16 years old.

* **Data**

The study was conducted as a longitudinal study. The data were collected from National Child Development Study (NCDS). It began from 1958 by recording the information of all babies in Great Britain (England, Wales, and Scotland). Then, the respondents were re-interviewed at the age of 7, 11, 16, 23, 33, 41-42, and 46-47 years old. 97.8% of the respondents were Caucasian.

At age 7, the participants were asked to do 4 cognitive tests:

1. Copying Designs Test
2. Draw-a-Man
3. Southgate Group Reading
4. Problem Arithmetic

At age 11, they were given 5 cognitive tests to complete:

1. Verbal General Ability
2. Nonverbal General Ability
3. Reading Comprehension
4. Mathematics
5. Copying Designs

At age 16, they were required to take 2 cognitive tests:

1. Reading Comprehension
2. Mathematics Comprehension

* **Methodology**

The tests scores obtained by the boys and girls at 7, 11, and 16 years old were noted down. The average intelligence quotient (IQ) and for different gender in each age and the standard deviations were calculated. The *t*-test was also used to test the statistic significance of the differences. From the data, all the sex differences were statistically significance at *p* < 0.01.

* **Result**

The girls at the ages of 7 and 11 years old had an IQ advantage of about 1 IQ point compared with the 7 and 11 years old boys. At the age of 16 years old, the intelligence of boys increased and they had an IQ advantage of 1.8 IQ points compared with the same age girls.

1. **Psychology**

* **The Objective of Study**

The objective of the study is to investigate the association between the music listening and the cognitive abilities of college students on doing their tasks.

* **Data**

The study used a repeated-measure design. The data were collected from the University of Maryland, Baltimore County (UMBC) at Shady Grove. The sample is a voluntary response sample.

32 undergraduate students in the range of 20-41 years old participated in this study on a voluntary basis. 25 of them were female, while 7 of them were male. Participants were given five arithmetic tests with twenty different questions on each test. All of them were required to answer the question under different music conditions (loud-music, soft-music, no music) and also different music intensity. The first test was needed to be completed in the soft music condition at low intensity. Then, they had to complete their second test in the loud music condition at low intensity. The third test was conducted without playing music. After the third test, participants were asked to finish the fourth and fifth tests in the soft music and loud music conditions, respectively, both at high volume intensity. Each test was given only 60 minutes. The participants could not use calculators to complete the tests. The performance scores were recorded to determine the effect of different music.

* **Methodology**

There were 3 hypotheses in this study:

The 1st hypothesis: Participants performed better in silence than they did in any music conditions.

The 2nd hypothesis: Participants’ performance scores would be lower in the presence of loud music at a high intensity.

The 3rd hypothesis: Participants’ performance would be better in the soft music condition when compared to the loud music condition.

The average scores were calculated and the paired sample t-test was performed for analysis.

* **Result**

The performance scores were significantly associated with music listening.

The 1st hypothesis was accepted. The performance scores were shown to be significantly higher in silence than in all four music conditions (*p* < 0.05).

Besides that, the 2nd hypothesis was also supported. The participants had a significantly higher test scores at low intensity than at high intensity of both types of music (*p* < 0.05). Performance scores were also significantly higher in silence than in loud music at high intensity (*p* < 0.05).

However, the 3rd hypothesis was rejected as there was no significant difference in test scores between participants in the soft music conditions and performance in the loud music conditions (*p* = 0.582 > 0.05).

**Reference**

Al-Ghamdi, S.H. (2013). The association between watching television and obesity in children of school-age in Saudi Arabia. *Journal of Family and Community Medicine, 20*(2), 83-89. doi: 10.4103/2230-8229.114767

Dolegui, A.S. (2013). The impact of listening to music on cognitive performance. *Inquiries Journal/Student Pulse, 5*(09). Retrieved from <http://www.inquiriesjournal.com/a?id=1657>

Lynn, R. (1994). Sex differences in brain size and intelligence: a paradox resolved. *Personality and Individual Differences, 17*(2), 257–271. doi: 10.1016/0191-8869(94)90030-2

Lynn, R., & Kanazawa, S. (2011). A longitudinal study of sex differences in intelligence at ages 7, 11 and 16 years. *Personality and Individual Differences, 51*(3), 321–324. doi:10.1016/j.paid.2011.02.028