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# Reading Arabic

## Legibility Studies for the Arabic Script

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### **A Note Regarding Spelling and References**

Parts of this dissertation are planned to be submitted to American psychology journals for publication. Because of that, the dissertation follows US English spelling and the reference guidelines and bibliography follow APA (American Psychological Association) guidelines.

### **About Transliterations**

The Arabic names follow the ALA-LC method with the exception of 2 cases: Arabic words that have gone into mainstream English such as Quran, Naskh, and Kufi; and letter names where the Unicode Standard naming has been followed. The latter is due to this researcher's font development habits.

# Glossary

## Design terms

**Axis:** The central axis around which letters are built.

**Contrast:** The difference between the thinnest and thickest parts of characters

**Leading:** The space between 2 lines of text.

**Modulation:** The changing thickness of a letter stroke.

**Naskh:** It is a small script that is characterized by an even distribution of round and straight elements and is quite clear to read and fast to write. Naskh is Arabic for the word copy.

**Optical size:** How large the typeface appears. In Latin, this is usually indicated by the relation of the x-height to the capitals. The larger the x-height, the larger the optical size is perceived to be.

**Spacing:** How far or how close the letters sit in relation to one another.

**Terminal treatment:** How the ending of letter strokes are drawn.

**Weight:** How heavy the typeface is.

**Width:** The horizontal proportion of a typeface. This could vary from normal to condensed or extended.

## Psychology terms

All definitions are taken from the Penguin Dictionary of Psychology (Reber, Allen, & Reber, 2009).

**Analysis of variance:** “A statistical method for making simultaneous comparisons between two or more means. An ANOVA yields a series of values (F values) which can be statistically tested to determine whether a significant relation exists between the experimental values.”

**Between-subjects design:** “A research design in which different groups of subjects are run under different conditions.”

**Confound:** “In experimental work, to fail to separate two variables with the result that their effects cannot be independently ascertained. If in an experiment on memory and age all the older participants are female and all the young are male, then the sex and age are “confounded” and the memory data cannot be properly interpreted.”

Counterbalancing: “An experimental procedure for controlling irrelevant factors. A good example is fatigue: if a subject is to perform two tasks, x and y, the order of running would be counterbalanced so that fatigue factors were spread equally across both x and y. To wit: one half of the subjects would perform task x first and one half task y first. If the experiment were run so that all subjects performed x first, it would not be possible to tell whether y was more difficult than x or merely that the subjects were getting tired.”

Dependent variable: “Any variable the values of which are, in principle, the result of changes in the values of one or more independent variables. In mathematics this notion of dependence is readily represented by an expression of the kind  $y=f(x)$ , where the values of y are dependent on the values of x. In psychology, the operative principle is that the behaviour of the subject under consideration is (like y) dependent upon the manipulation of some other factors (the analogue of x).”

Descriptive statistics: “A general label for statistical procedures used to describe, organize and summarize samples of data. Basically, a descriptive statistic is a number that represents some aspect of a sample of data.”

Fixation (visual, def.): “The orienting of the eyeball so that the projection of the viewed object falls on the fovea and is in focus. The object or location in space is called the fixation point and lies along the fixation line, which can be drawn from the fovea through the pupil to the object.”

Greco-Latin square or Orthogonal Latin squares: “A balanced two-way classification scheme in which each condition occurs just once in each row and column... This balancing is often incorporated into experimental designs so that the order of administration of treatments is perfectly balanced across subjects. Two such Latin squares are orthogonal if, when combined, the same pair of symbols occurs only once in the combined square. This composite square is called a Greco-Latin square.”

Independent variable: “Any variable the values of which are, in principle, independent of the changes in the values of other variables. In an experiment, any variable that is specifically manipulated so that its effects upon the dependent variables may be observed. Also called the experimental variable, the controlled variable and the treatment variable.”

Inferential statistics: “Statistical procedures used to make inferences. Basically, they utilize the mathematics of probability theory to infer or induce generalizations about populations from sample data.”

Interaction: Reciprocal effect or influence... In statistical interaction the effects of two (or more) variables are interdependent; e.g. task difficulty and arousal often interact so that increased arousal increases performance on easy tasks but decreases it on difficult tasks.”

Main effect: “In statistical analysis of data, the basic relationship between a single independent variable and a single dependent variable.”

Null hypothesis: “A hypothesis of no difference, no relationship. In the standard hypothesis-testing approach to science one attempts to demonstrate the falsity of the null hypothesis, leaving one with the implication that the alternative, mutually exclusive, hypothesis is the acceptable one.”

Order effects: “Effects that are attributed to the order in which treatments are presented in an experiment. Order effects can confound an experiment and typically counter-balancing procedures are employed as a control.”

Regression: "In reading, any eye movement back over material already read. The frequency of such regressions is related to the difficulty of the material and the reading skills of the individual."

Saccade: "A quick eye movement, a jump of the eyes from one fixation point to another. Saccadic movements are seen most clearly during reading and the scanning of visual displays."

Standard deviation: "A measure of the variability of a sample from the mean of the sample."

Standard error of the mean: "The standard deviation of the theoretical sampling distribution of the mean. In practice it is used as an estimate of the degree to which the obtained mean of a sample may be expected to deviate from the true population mean."

Statistical significance: "The degree to which an obtained result is sufficiently unlikely to have occurred under the assumption that only chance factors were operating, and therefore the degree to which it may be attributed to systematic manipulations. The degree itself is typically specified and denoted as probability, e.g.  $p < 0.05$  means that the results obtained (or more extreme results) could only have occurred by chance in fewer than 5 cases in 100. The smaller the p value, the more significant the results; that is, the less likely that they occurred by chance."

Within-subjects design: "An experimental design in which each subject is used in all conditions."

