UNIVERSITI TEKNOLOGI MARA

HUMAN INDIVIDUALISATION FOR MONOZYGOTIC TWINS USING EAR AND EAR PRINT PATTERN

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ABSTRACT

Individualisation of monozygotic twin based on ear pattern and ear print is a challenging task since they hold the closest-genetic based relationship. This study was designed to establish the uniqueness and individual characteristic of ear pattern and ear print between monozygotic twins. Our study was conducted based on large monozygotic twin data that contained 95 pairs of monozygotic twins with data from right and left ear of each monozygotic twin. Monozygotic twins were selected randomly throughout Malaysia, with age range between 7 to 31 years old. Measurements for ear pattern were taken using digital calliper with the resolution of 0.01mm. Results showed that the mean differences of outer ear landmarks measurement between pairs of monozygotic twins were small which is between (M=0.77, SD=0.59) and (M=2.32, SD=2.20). There were no significant differences between ears of monozygotic twins for almost all dimensions between pair of monozygotic twin and between inter-landmarks which is a set of points that correspond to an anatomical position on ear that is comparable among respondents. MANOVA analysis showed that out of 95 pairs of monozygotic twins, only 4 pairs showed significant different ($p<0.05$) of ear pattern between their twin pairs. Analysis of ear print revealed that differences in Euclidean distance for all measurements of ear print between each pair of monozygotic twins were less than 9.38%. This study is a step toward scientific analysis of ear as a supportive tool for personal identification but it is proved that this tool could not be applied on monozygotic twins.

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CHAPTER ONE
INTRODUCTION

1.1   BACKGROUND OF STUDY

One of the fundamental aspects of legal and forensic work is in identification or individualisation a person. In human identification, their individuality has to be established by determining the features or set of qualities that distinguishes them from all others and makes them who they are (Arcaute and Navarro, 2006). Forensic anthropology is one of the sub-disciplines in forensic biology and it applies the anthropological techniques of human remains for law enforcement (Dirkmaat, 2008). In anthropology, the study of human remains or body measurement for use in anthropological classification and comparison is known as anthropometric measurement (Krishnan, 2006).

In science of human identification, Bertillon system has been introduced by Alphonse Bertillon (1853-1914), a French Criminologist which used various parts of body. These were done with an assumptions and fundamental that human characteristics such as head, finger, and ear size remains constant throughout life after attaining its full growth (Purkait, 2012). Bertillon was probably the first scientist that discovered ear as a mean of identification. As early as 1896, Bertillon has stated that every part of human anatomy, including ear, was so unique, that any individual could be identified if the body part were properly measured and compared (Cameriere *et al*., 2011). The development of human external ear is a complex process starts from early embroyonic life until postnatal period and it influences the uniqueness of ear of each individual (Wright, 1997). In embroyonic state, epigenetic process occurred and it will cause differences in individual appearances, physiology, cognition and also behaviour. Scientifically, epigenetic mechanisms defined as molecular events that rule the way the environment regulates the genomes of organisms (Powledge, 2016). During early development, epigenetics may function in important ways in response to a vast environmental trigger that lead to variety physical characteristics. Mechanism involved in this process are DNA methylation, DNA packaging by histones and histone modifications (Powledge, 2016).