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SKELETAL MORPHOLOGY OF THE HUMAN HAND AS APPLIED IN FORENSIC ANTHROPOLOGY

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DECLARATION

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy in Anatomy at the University of Pretoria, Pretoria. It has not been submitted before for any degree or examination in any other University.

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TABLE OF CONTENTS

List of figures

List of tables

ABSTRACT

The lack of detailed descriptions makes positive identification of individual bones of the human hand difficult. In some instances, labelled photographs and line diagrams depicting a few anatomical features are available in the literature while in other cases, unlabelled photographs and diagrams are provided. Textbooks generally describe each hand bone as having a head, shaft and base. The morphology of metacarpals is more commonly described than that of the phalanges. Thus, identification and siding of hand bones are rare, which excludes them from use in many forensic cases. Forensic anthropological studies also include the determination of demographic characteristics such as stature and sex. Parts of the human skeleton that are accurate predictors in determining stature and sex include the skull, pelvis, femur and tibia. Hand bones are often excluded from such studies due to their relatively small size and poor preservation. The aims of this study were firstly, to provide detailed morphological descriptions of metacarpals and phalangeal bones of the human hand; secondly, to develop regression formulae for stature using the hand bones and thirdly, to develop discriminant function formulae in which the hand bones can be used to determine the sex of an unknown individual. The study comprised 200 sets of hands of South African individuals. The results indicate that there are morphological features of individual bones of the human hand that can be used to identify and side them. Regression formulae have been devised whereby the length of a hand bone can be regressed to that of a long bone, which in turn can then be used to determine stature. The sexing accuracy, using the bones of the hand, is high for males and females. Average accuracies recorded were more than 80% in most cases, and more than 75% in all cases. Analyses of human hand bones can thus add valuable information when assessing skeletons of unknown individuals.

OPSOMMING

Weens die gebrek aan uitvoerige beskrywings, is dit moeilik om afsonderlike beentjies van die menslike hand positief te identifiseer. Soms is daar geannoteerde foto's en lyndiagramme in die literatuur beskikbaar, wat 'n paar anatomiese eienskappe uitbeeld, maar in ander gevalle is die fotos en lyndiagramme onbenoem. In handboeke word elke handbeentjie gewoonlik beskryf as synde met 'n kop, skag en basis. Die morfologie van die metakarpaalbene word meer dikwels beskryf as dié van die falankse. Identifikasie en die kant bepaling van handbeentjies is dus skaars en so word hulle van baie forensiese gevalle uitgesluit. Forensiese antropologiese studies sluit ook die bepaling van demografiese eienskappe soos liggamslengte en geslag in. Die skedel, bekken, femur en tibia van die menslike skedel is akkurate aanduiders by die bepaling van statuur en geslag. Handbeentjies word dikwels van sulke studies uitgelaat omdat hulle relatief klein en swak bewaar is. Die doel van hierdie studie was ten eerste die voorsiening van gedetailleerde morfologiese beskrywings van metakarpale en falankse van die menslike hand, tweedens, die ontwikkeling van omskakelingsformules vir statuur met aanwending van die handbeentjies en derdens, die ontwikkeling van diskriminante funksie formules waarby die handbeentjies gebruik kan word om die geslag van 'n onbekende individue te bepaal. Die studie het bestaan uit 200 stelle handbeentjies van Suid-Afrikaanse individu. Die resultate dui aan dat daar benige landmerke is om elke handbeen te identifiseer en te onderskei tussen links en regs. Die onderskeie beentjies van die menslike hand se lengte kan gebruik word om dié van 'n langbeen te bepaal, wat op sy beurt gebruik kan word om statuur te bedien. Akkuraatheid van geslagsbepaling deur middel van handbeentjies is hoog vir mans en vrouens. Gemiddelde betroubaarheid was meer as 80%. Ontleding van menslike handbeentjies kan dus 'n waardevolle bydrae lewer by die ondersoek van skelette van onbekende individue.

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It is said that there are two kinds of knowledge, the knowledge of religions and the knowledge of the body. I pray that I have fulfilled both of these in an attempt to better understand the design of each bone of the hand with the wisdom given to me by the Almighty Insha Allaah Ameen.