

Biological Anthropology of Aging – Past, Present and Future

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ABSTRACT

Biological anthropologists have a strong tradition of studying growth and development and research on aging has been limited. This paper explores the past and current contribution of biological anthropologists to the field of aging through an examination of the American Journal of Physical Anthropology (AJPA) and the American Journal of Human Biology (AJHB). It is clear from this survey that biological anthropologists and human biologists have predominantly studied growth and developmental processes relative to aging. However, there is a trend of increasing interest in aging over time. In the AJHB, papers discussing chronic disease were predominant, followed by reproductive aging (19%), bone aging (15%) and body composition (10%). Within the AJPA, the majority of articles were in the field of human biology (43%) and bioarchaeology (42%) with a lesser contribution from primatology (14%) and dermatoglyphics (1%). Biological anthropologists still have great potential to make contributions to gerontology with our evolutionary and holistic perspectives and focus on cross-cultural research.

Key words: elderly, gerontology, life cycle, aging

Introduction

Biological anthropologists have a strong tradition of studying growth and development in extant, historical and early hominid populations. Variation within and across populations has been explored from evolutionary, ecological, genetic, cross-cultural and cross-species perspectives. Despite urging by several authors in review articles, the study of aging has been relatively under-explored, as represented by the articles published in major anthropo-

logical and human biological journals. The lack of interest in aging amongst biological anthropologists may largely be a result of historical development of the field. Additionally, aging represents a period of the life cycle where there is minimal contribution to evolution of populations. Thus, research on aging represents a shift in focus of the field. The marginalization of aging research is unfortunate given the great expansion of the elderly population

across the world, the possible evolutionary uniqueness of the human post-reproductive period, and the tremendous amount of variation in the aging process.

Material and Methods

This paper explores the past and current contribution of biological anthropologists and human biologists to the field of aging through an examination of the American Journal of Physical Anthropology (AJPA) and the American Journal of Human Biology (AJHB) and discusses future research potential.

It has been argued that growth and development has been the predominant focus among biological anthropologists and human biologists. To test this hypothesis, the article titles and abstracts of the AJPA and AJHB were surveyed. All published articles were counted and categorized as growth and development, aging or neither. Obituaries and meeting abstracts were excluded. Articles were classified as growth and development if they specifically examined the process of growth and development from conception to adult stages, discussed a childhood disease, examined behavior of juvenile humans or primates, or examined a forensic technique to determine age at death of juveniles. Articles were categorized as aging if process of aging from adult stages

to death (specifically examining the process of progressive, cumulative, degenerative change), discussed an age-associated disease, examined behavior of older individuals of a population or examined a forensic technique to determine age at death of older adults.

Results

Figures 1 and 2 depict the percentage of articles on growth and development and aging topics over the history of the AJPA and AJHB, respectively. It is clear from this survey that biological anthropologists and human biologists, at least those that publish in these journals, have predominantly studied growth and developmental processes relative to aging processes. However, there does seem to be a trend of increasing interest in aging over time.

Within the AJPA, the majority of articles were in the field of human biology (43%) and bioarchaeology (42%) with a lesser contribution from primatology (14%) and dermatoglyphics (1%). Surprisingly there were no articles in paleoanthropology, although the evolution of life span among hominids has been examined in other publications. In the AJPA, exploration of bone aging, from all sub-fields within biological anthropology was predominant (Figure 1). Related to bone ag-

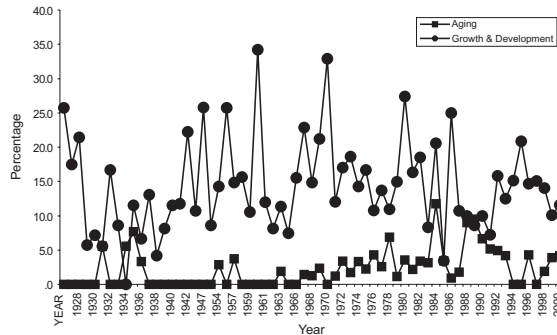


Fig. 1. Aging and growth and development articles in AJPA over time.

ing, studies examining age at death in older skeletons was the second most common topic. Body composition changes with age and chronic degenerative disease were about equally covered with a much lesser representation of reproductive aging, longevity, exercise, behavior and genetics.

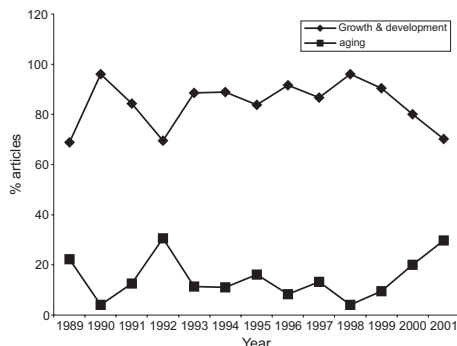


Fig. 2. Aging and growth and development articles in AJHB over time.

In the AJHB, papers discussing chronic disease were predominant, followed by reproductive aging (19%), bone aging (15%) and body composition (10%, Figure 4). In contrast to the growth and development literature, there was a lesser focus on variation in age-related physiological changes, demography and nutrition. Given the historical focus on phenotypic variation within physical anthropology, it

is not surprising that our primary contribution has been in the areas of bone aging and body composition.

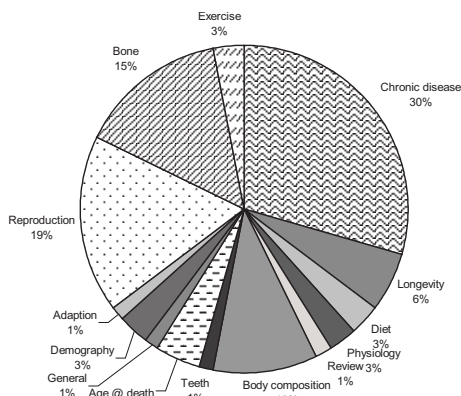


Fig. 4. Percentage of aging articles in AJHB on various topics¹⁴.

Discussion

While the study of aging may represent a shift in focus for biological anthropologists, there are several compelling reasons for studying aging. From the evolutionary perspective, aging as a phenomenon can be considered a paradox. How and why would a progressive decline in function evolve? Furthermore, organisms vary a great deal in life span yet we still know relatively little about the ecological and evolutionary factors which may lead to life span differences. Is there any reason that menopause may be adaptive and does menopause in humans represent an evolutionary strategy or simply an epiphenomena of modern life? These questions have been extensively reviewed elsewhere but deserve considerably more attention by biological anthropologists. There are two other compelling reasons for biological anthropologists to study aging, demographic trends and patterns of variation.

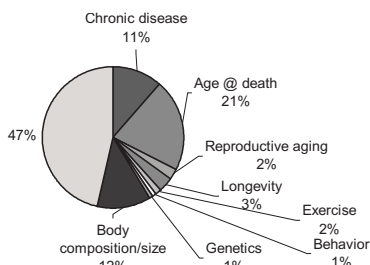


Fig. 3. Percentage of aging articles in AJPA on various topics.

Changing demographics

Over the course of hominid evolution, the life span has increased dramatically. Based on allometric relationships, it has been estimated that the maximum life-span has increased from approximately 53 years for Australopithicines to 122 years for modern humans. Life expectancy, however, may have been as low as 15 years for Australopithicines.. Life expectancy was 25 years or less until the most recent centuries. In the United States, similar to other developed countries, life expectancy has almost doubled in the last century from 46 years in 1900 to 77 in 1997. Today, life expectancy varies tremendously across populations from a low of 35 years in Botswana to a high of 83 years in Andorra (Table 1). Whether we will continue to see an increase in human life expectancy is of considerable debate. Furthermore, the HIV/AIDS epidemic in Africa is likely to *decrease* life expectancy in most African countries, further widening the life expectancy gap between developing and developed countries.

The increase in life expectancy and historical fertility trends have lead to a great increase in the percentage of older adults in developed nations (Figure 5). Today, 1/5 of the developed world is over 60 years of age and moderate level projections suggest that by 2030, one in every third person in developed countries will be over 60 years old. In the United States, the 65 and over population increased 11-fold in the 20th century. While developing countries have a lower life expectancy and the percentage of older adults is relatively low, the number of individuals over 60 is greater and growing faster than in the developed world. In fact, 59% of the world’s elderly population (65 years and over) live in developing countries. Worldwide, 800,000 people turn 65 per month. Japan’s population over 65 has increased from 7% to 14% in 26 years and other Asian countries are expected to see similar increases shortly. This is a very rapid

TABLE 1
LIFE EXPECTANCY IN SELECTED COUNTRIES¹⁴

Country or area	Life expectancy (years)	
	Male	Female
Afghanistan	47.32	45.85
Andorra	80.58	86.58
Argentina	72.1	79.03
Australia	77.15	83
Bangladesh	61.08	60.74
Bolivia	61.86	67.1
Botswana	35.15	35.43
Cambodia	54.81	59.5
Canada	76.3	83.25
Central African Republic	42.08	45.13
Chile	72.83	79.62
China	70.02	73.86
Croatia	70.52	77.96
Ecuador	68.79	74.57
Egypt	61.96	66.24
Ethiopia	43.36	45.09
France	75.17	83.14
Hong Kong S.A.R	77.1	82.69
Iceland	77.42	82.07
India	62.55	63.93
Indonesia	66.2	71.09
Iran	68.87	71.69
Israel	76.82	81.01
Japan	77.73	84.25
Malawi	36.055	37.15
Macau	78.97	84.73
The Netherlands	75.7	81.59
North Korea	68.31	74.44
Peru	68.18	73.12
Russia	62.29	72.97
Rwanda	38.14	39.2
Saudi Arabia	66.7	70.2
South Africa	45.19	45.68
Sweden	77.19	82.64
United States	74.5	80.2

population change in comparison to European countries who saw similar increases over the course of 100+ years. These rapid demographic changes represent a unique set of circumstances to which individuals, populations and nations must

adapt. Human biologists are ideally suited to study the impact of changing demographics on human cultural and biological variation.

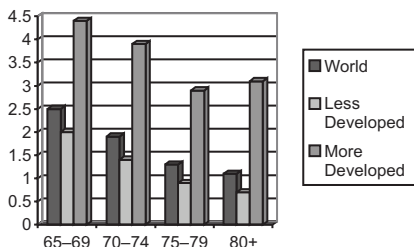


Fig. 5. Percentage of population over 65 years by level of development.

Variation

Older adults across cultures experience widely varying environmental, social and economic circumstances, which contribute to great variability in aging rates, body composition and health. Indeed, an axiom of gerontology is that variation is greater among older populations compared to younger groups on almost anything you measure: socio-cultural, psychological, economic, physiological and phenotypic. Aging rates vary across and within species, across populations and within populations and even across organ systems within individuals. This has made the search for biomarkers of aging elusive despite the tremendous amount of monetary and scientific resources dedicated to the field. There have also been great efforts within the field of gerontology to describe »normal« aging, exemplified by the Baltimore Longitudinal Study on Aging. Both of these fields and gerontology in general has been limited by focusing primarily on developed countries. This focus has been further limited by a primary focus on majority populations within countries. The focus on normal aging gives the impression that there is one way to age and anything deviant from the typical pattern of Euro-

pean derived populations is pathological. Furthermore, it has limited the research questions that have and can be made. We know very little about the sociocultural, economic, ecological, evolutionary and genetic factors that contribute to *variation* in aging and very few gerontologists have examined the interplay of these factors. As biological anthropologists are in the business of describing and explaining human variation from an evolutionary, cross-cultural and holistic perspective, we have the potential to have a great impact on the field of gerontology.

The future of biological anthropology of aging

Biological anthropologists have made a small but significant impact on the field of gerontology yet biological anthropology is still primarily focused on processes related to growth and development rather than aging. While biological anthropologists publish aging research in non-anthropological journals, we still have a minor presence in our field. If there is a real trend as suggested by the data presented here, the interest in aging is increasing among biological anthropologists. We still have great potential to make contributions to gerontology with our evolutionary and holistic perspectives and focus on cross-cultural research.

Despite current demographic trends, anecdotal evidence suggests that enrollment in college courses, graduate programs and fellowships in aging are declining. This will no doubt affect the future of aging research in biological anthropology. With this in mind, a special symposium was organized at the 1999 meetings of the American Anthropological Association entitled, »Biological Anthropology of Aging: Current Approaches and Future Directions« to stimulate interest in aging research among biological anthropologists¹. Most of the papers in this issue were presented in this session. There are a wide range of topics covered,

both theoretical and current research reports. Thus, this collection of papers is a

good representation of the field of biological anthropology of aging.

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BIOLOŠKA ANTROPOLOGIJA STARENJA: PROŠLOST, SADAŠNJOST I BUDUĆNOST

SAŽETAK

Biološki antropolozi imaju snažnu tradiciju istraživanja rasta i razvoja, dok su studije starenja u mnogo manjoj mjeri zastupljene. Pregledom publiciranih radova u časopisima *American Journal of Physical Anthropology (AJPA)* i *American Journal of Human Biology (AJHB)* u ovom se radu daje prikaz doprinosa – prošlih i današnjih – bioloških antropologa istraživanjima starenja. Ovaj pregled jasno pokazuje kako se biološki antropolozi i humani biolozi u neusporedivo većoj mjeri bave pitanjima rasta i razvoja u odnosu na ona starenja. No prisutan je trend porasta zanimanja za starenje. U radovima objavljenim u *AJHB* najviše je pažnje posvećeno kroničnim bolestima, potom reproduktivnom starenju (19%), starenju kostiju (15%) i tjelesnoj konstituciji (10%). U *AJPA*, najveći broj članaka je iz područja humane biologije (43%) i bioarheologije (42%) s manjim doprinosima iz primatologije (14%) i istraživanja dermatoglifa (1%). Autor zaključuje kako biološki antropolozi – s evolucijskih i holističkih pozicija te usmjerenja na trans-kulturalna istraživanja – još uvijek uvelike mogu doprinjeti istraživanjima u gerontologiji.