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S.-C. Li

Aging, Theories of

Because theories of aging in the behavioral and social sciences have come from a variety of disciplines it is often difficult to distinguish between formal theoretical frameworks and theoretical models that seek to systematize sets of empirical data. This article, therefore, will discuss current thought on theory building in aging, and then summarize exemplars of theoretical frameworks that inform the field origination from biology, psychology and the social sciences.

1. Theory Building in Aging

1.1 Historical Development of Theories of Aging

Early gerontologists looked for conceptual frameworks that might explain human aging by looking at popular and ancient models, including the bible, Sanskrit, medieval allegories, other ancient texts and even archaeological evidence to explain individual differences in well being and maintaining competence through the various stages of life (e.g., Hall 1922). These early models of aging typically represent broad world views, such as the biblical admonition that obedience to God's commandments would ensure a long life. New historical contexts, however, result in new explanations of aging, whether of the medieval explanation of old women as witches or the modern conception of the biological advantages of female aging. But as in Hall's writings, they may also include critiques of contemporary societal arrangements.

More modern views of the complexity of aging may be found in Cowdry's classical opus *Problems of Aging* (1939). It contains a mixture of assertions that aging

resulted from 'degenerative diseases' to contentions that social context affected the expression of aging and could lead to the difference between what Rowe and Kahn (1997) have referred to as the difference between 'normal' and 'successful' aging. As scientific insights on the aging process have accumulated during the twentieth century, a movement has occurred from broad world views on aging to more circumscribed theoretical models that are driven by disciplinary perspectives but also by the fads and explanatory frameworks that have waxed and waned in the scientific enterprise (cf. Hendricks and Achenbaum 1999).

1.2 Models and Explanation

Distinctions must be made between theories and other aspects of knowledge development. As a first stage, we find statements describing regularities detected in the process of systematic observations. A second stage is represented by prototypical models that attempt to depict how empirical generalizations are related to each other. A third stage may be characterized by the term 'paradigm' which implies a shift in scientific efforts represented by the accumulation of empirical generalizations, models, and theories. In contrast to these terms, which are of course also important for knowledge development, the focus of a theory should be upon the construction of explicit explanations that account for empirical findings (cf. Bengtson et al. 1999).

1.3 Theory Development and Research Design in Aging

Theory development in aging has been impacted markedly by advances in research design. One of the early impacts was the development of the age–period cohort model which required theory development to distinguish between age changes (measured longitudinally) and age differences (measured cross-sectionally). The distinction of within-subject maturational effects and between-subjects cohort differences has also informed theory development. In addition, the advent of restrictive factor analysis and structural equation modeling has made it possible to provide empirical tests of structural relationships in various domains that tend to change across time–age and differ across groups (cf. O'Rand and Campbell 1999, Schaie 1988).

2. Biological Theories of Aging

2.1 Biological Theories of Senescence

Theories explaining the biological basis of human aging are either stochastic theories that postulate senescence to be primarily the result of random damage to the organism, or they are programmed theories that hold that senescence is the result of genetically determined processes. Currently most popular theories include: (a) the free radical theory, which holds that various reactive oxygen metabolites can cause extensive cumulative damage; (b) caloric restriction, which argues that both lifespan and metabolic potential can be modified by caloric restriction (thus far not demonstrated in humans); (c) somatic mutation, arising from genetic damage originally caused by background radiation; (d) hormonal theories, proposing, for example, that elevated levels of steroid hormones produced by the adrenal cortex can cause rapid aging decline; and (e) immunological theories that attribute aging to decline in the immune system. Another prominent view is that the protective and repair mechanisms of cells are insufficient to deal with the cumulative damage occurring over time, limiting the replicative ability of cells (cf. Cristofalo et al. 1999, Hayflick 1994).

2.2 Stress Theories of Aging

These theories argue that excessive physiological activation have pathological consequences. Hence differences in neuroendocrine reactivity might influence patterns of aging. The focus of such theories is not on specific disease outcomes, but rather on the possibility that neuroendocrine reactivity might be related generally to increased risk of disease and disabilities. Stress mechanisms are thought to interact with age changes in the hypothalamic–pituitary–adrenal (HPA) axis, which is one of the body's two major regulatory systems for responding to stressors and maintaining internal homeostatic integrity. Individual differences in reactivity may cumulatively lead to major individual differences in neuroendocrine aging as well as age-related risks for disease. Certain psychosocial factors can influence patterns of endocrine reactivity. Perceptions of control and the so-called Type A behavior pattern may influence increased reactivity with age. Gender differences in neuroendocrine reactivity are also posited because of the known postmenopausal increase in cortisol secretion in women not treated with estrogen replacement therapy (cf. Finch and Seeman 1999).

3. Psychological Theories of Aging

As for other life stages, there do not seem to be many overarching theories of psychological aging, but emphasis in theoretical development is largely confined to a few substantive domains. A recent exception to this observation is the theory of selection, optimization and compensation (SOC) advocated by P. Baltes (1997, Baltes and Baltes 1990). This theory suggests that there are psychological gains and losses at every

life stage, but that in old age the losses far exceed the gains. Baltes suggests that evolutionary development remains incomplete for the very last stage of life, during which a societal supports no longer suffice to compensate for the decline in physiological infrastructure and losses in behavioral functionality (cf. Baltes and Smith 1999).

3.1 Theories of Cognition

A distinction is generally made between cognitive abilities that are fluid or process abilities that are thought to be genetically overdetermined and which (albeit at different rates) tend to decline across the adult lifespan, and crystallized or acculturated abilities that are thought to be learned and be culture-specific, and which tend to be maintained into advanced old age. This distinction tends to break down in advanced old age as declining sensory capacities and reduction in processing speed also leads to a decline of crystallized abilities. Nevertheless, most theories of adult cognition have focused upon explaining the decline of fluid abilities, neglecting to theorize why is it that crystallized performance often remains at high levels into late life.

Most theoretical perspectives on cognitive aging can be classified into whether the proposed primary causal influences are distal or proximal in nature. Distal theories attribute cognitive aging to influences that occurred at earlier periods in life but that contribute to concurrent levels of performance. Other distal explanations focus on social–cultural changes that might affect cognitive performance. These explanations assume cumulative cohort effects that lead to the obsolescence of the elderly. Distal theories are useful, particularly in specifying why the observed age differences have emerged, since it is generally agreed that mere passage of time can not account for these differences.

Proximal theories of aging deal with those concurrent influences that are thought to determine age-related differences in cognitive performance. These theories do not specify how the age differences originated. Major variations of these theories include strategy-based age differences, quantitative differences in the efficiency of information processing stages implicating deficits in specific stages, or the altered operation of one or more of the basic cognitive processes (cf. Salthouse 1999).

3.2 Theories of Everyday Competence

Theories of everyday competence seek to explain how an individual can function effectively on the tasks and within the situations posed by everyday experience. Such theories must incorporate underlying processes, such as the mechanics (or cognitive primitives) and

pragmatics of cognitive functioning, as well as the physical and social contexts that constrain the individual's ability to function effectively. Because basic cognitive processes are typically operationalized to represent unitary trait characteristics, it is unlikely that any single process will suffice to explain individual differences in competence in any particular situation, Hence, everyday competence might be described as the phenotypic expression of combinations of basic cognitive processes that permit adaptive behavior in specific everyday situations.

Three broad theoretical approaches to the study of competence have recently been advocated. The first perspective views everyday competence as a manifestation of latent constructs that can be related to models of basic cognition (see also *Cognitive Aging*). The second approach conceptualizes everyday competence as involving domain-specific knowledge bases. In the third approach, the theoretical focus is upon the fit, or congruence, between the individual's cognitive competence and the environmental demands faced by the individual.

An important distinction must further be made of the distinction between psychological and legal competence. While the former is an important scientific construct, the latter refers to matters of jurisprudence that are involved in the imposition of guardianship or conservatorship designed to protect frail individuals as well as to limit their independent decision-making ability. Although legal theorizing incorporates aspects of virtually all psychological theories of competence, it does focus in addition the definition of cognitive functioning and competence as congruence of person and environment, upon the assignment of status or disabling condition and a concern with functional or behavioral impairment (cf. Schaie and Willis 1999).

3.3 Social–Psychological Theories

Social psychologists coming from a psychological background are concerned primarily with the behavior of individuals as a function of microsocial variables. Relying upon experimental or quasi-experimental designs, they seek to understand social phenomena using person-centered paradigms whose core is the structural and functional property of individual persons. Social–psychological approaches to aging have contributed to the understanding of numerous normal and pernicious age-related phenomena. There has been an increased interest in theoretical formulations that explain how social–psychological processes exert normative influences on life course changes. Included among theories that have received recent attention are control theories contrasting primary and secondary controls, coping theories that distinguish between accommodative and assimilative coping, and theories about age differences in attributive styles. There are also theories that blend psychological and sociological

approaches, such as the convoy theory and the support–efficacy theory.

Of particular recent interest has been the model of learned dependency (Baltes 1996). In this theory, the dependency of old age is not considered to be an automatic corollary of aging and decline, but rather is attributed in large part to be a consequence of social conditions. This theory contradicts Seligman's (1975) model of learned helplessness, which postulates dependency to be the outcome of noncontingencies and which sees dependency only as a loss. Instead it is argued that dependency in old people occurs as a result of different social contingencies, which include the reinforcement for dependency and neglect or punishment in response to pursuit of independence.

Also of currently prominent interest is socio–emotional selectivity theory. This theory seeks to provide an explanation of the well-established reduction in social interactions observed in old age. This theory is a psychological alternative to two previously influential but conflicting sociological explanations of this phenomenon. Activity theory considered inactivity to be a societally induced problem stemming from social norms, while the alternative disengagement theory suggested that impending death stimulated a mutual psychological withdrawal between the older person and society. By contrast, socio–emotional selectivity theory holds that the reduction in older persons' social networks and social participation should be seen as a motivated redistribution of resources by the elderly person. Thus older persons do not simply react to social contexts but proactively manage their social worlds (cf. Baltes and Carstensen 1999).

4. Sociological Theories of Aging

4.1 Anthropological Theories

Interest in old age came relatively late for anthropologists with an examination of ethnographic data in the *Human Relations Area Files* in 1945 that considered the role of the aged in 71 primitive societies. Early theoretical formulations propose a quasi-evolutionary theory that links the marginalization of older people to modernization. Current anthropological theorizing is informed by investigations of the contexts in which older adults are living that range from age-integrated communities to those in the inner city and in urban settings, as well as by the study of special populations that include various ethnic group and older people with disabilities. Common theoretical themes currently addressed include the complexity of the older population leading to differential experiences of aging in different cultural context, the diversity of aging within cultures, the role of context specificity, and the understanding of change over the life course across different cultural settings. Prevailing issues in anthropological theorizing on aging seem to focus first on how maturational differences are incorporated into a given social order, and second, the clarification of the variability as to how differences in maturity are modeled by human cultures in transforming maturation into ideas about age and aging.

Anthropological theories consider generational systems as fruitful ways of thinking about the life course. They argue that every human society has generational principles that organize social lives. Generations have little to do with chronological time, but rather designate position in a web of relationship; hence kinship systems are emphasized. Although age–class systems have explanatory power in primitive societies, they are not helpful as life course models in complex societies because of their variability. If anything, age–class systems are more likely to explain social structuring in males than in females. More useful for the understanding of complex societies seem to be models of staged life courses. Such models suggest that the life course in complex societies is based on combinations of generational and chronological age, and further is understood as staged or divisible into a variable number of age grades.

Anthropologists also distinguish between theories about age from those about aging or the aged. Theories about age explain cultural and social phenomena. That is, how is age used in the regulation of social life and the negotiation of daily living. Theories about aging are theories about living, the changes experienced during the life course, and the interdependencies throughout life among the different generations. Finally, theories about the age focus on late life, describing old age not only as a medical and economic problem but also as a social problem in terms of social support and care giving (cf. Fry 1999).

4.2 Life Course Theories

Life course theories represent a genuinely sociological approach to what, at the level of surface description, is a rather individual phenomenon as represented by the aging and life course patterning of human individuals. Much of this theorizing occurred subsequent to the recognition that individual aging occurred concurrently with the occurrence of social change, providing impetus to efforts trying to separate aging from cohort effects. Life course theories generally represent a set of three principles. First, the forms of aging and life course structures depend on the nature of the society in which individuals participate. Second, while social interaction is seen as having the greatest formative influence in the early part of life, such interaction retains crucial importance throughout the life course. Third, that social forces exert regular influences on individuals of all ages at any given point in time. However, such thinking also introduces three signifi-

cant intellectual problems. These are the tendency to equate the significance of social forces with social change, neglecting intracohort variability, and a problematic affirmation of choice as a determinant of the life course.

Life course phenomena can be treated at least at three levels of analysis. First, at the individual level, the structure of discrete human lives can be examined from birth to death. Second, one can examine the collective patterning of individual lives in a population. Third, it is possible to examine the societal representation of the life course in terms of the socially shared knowledge and demarkation of life events and roles. For each of these levels it is in turn possible to specify personological aspect that are thought to be part of the organism as well as the enduring contextual factors that were internalized at earlier life stages. But another crosscutting level involves the social–cultural and interactional forces that shape the life course (cf. Dannefer and Uhlenberg 1999).

4.3 Social Theories of Aging

Social theories of aging have often been devised to establish theoretical conflict and contrast. Two dimensions of contrast that have been used involve the cross-classification of normative versus interpretive theories and macro versus micro theories. But there are also intermediate theoretical perspectives that bridge these two approaches or that link different approaches. Modernization and aging theory would be an example of a normative macrotheory. Self and identity theories represent interpretive microtheories. Disengagement theory represents a normative linking theory, and the life course perspective discussed above represents a theory that is both linking and bridging (cf. Marshall 1999).

Recent generalizations that cut across most social theories seem to focus on three changes in the construction of the social phenomenon of aging. These changes suggest that life course transitions are decreasingly tied to age with a movement from age segregation to age integration. Second, that many life transitions are less disjunctive, more continuous, and not necessarily irreversible processes. Third, specific pathways in education, family, work, health, and leisure are considered to be interdependent within and across lives. Life trajectories in these domains are thought to develop simultaneously and reciprocally, rather than representing independent phenomena (O'Rand and Campbell 1999).

A prominent example of a social theory of aging is presented by the aging and society paradigm (Riley et al. 1999). The distinguishing features of this paradigm are the emphasis on both people and structures as well as the systemic relationship between them. This paradigm includes life course but it also includes the guiding principles of social structures as having greater meaning than merely providing a context for people's lives. This theory represents a cumulative paradigm. In its first phase, concerned with lives and structures, it began with the notion that in every society age organizes people's lives and social structures into strata from the youngest to the oldest, and raised questions on how age strata of people and age oriented structures arise and become interrelated. A second phase concerned with the dynamisms of age stratification defined changing lives and changing structures as interdependent but distinct sets of processes. The dynamism of changing lives began with the recognition of cohort differences and noted that because society changes, members of different cohorts will age in different ways. A second dynamism involves changing structures that redefine age criteria for successive cohorts.

In a third phase the paradigm specified the nature and implication of two connecting concepts, that of the interdependence and asynchrony of these two dynamisms, that attempt to explain imbalances in life courses as well as social homeostasis. A fourth phase deals with future transformation and impending changes of the age concepts. It introduces the notion of age integration as an extreme type of age structure as well as proposing mechanisms for cohort norm formation.

See also: Aging and Health in Old Age; Aging Mind: Facets and Levels of Analysis; Cognitive Aging; Differential Aging; Ecology of Aging; Indigenous Conceptions of Aging; Life Course in History; Old Age and Centenarians

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Agnosia

Agnosia is a fascinating condition in which, as a consequence of acquired brain damage, patients lose the ability to recognize familiar stimuli, despite normal perception of those stimuli. For example, when encountering the faces of familiar persons such as family members or close friends, a patient with agnosia is unable to identify those persons, or even to recognize that they are familiar. A patient may look at pictures of entities such as animals or tools, and have no idea what the stimuli are. Or a patient may hear well-known sounds, such as a fire siren or a ringing phone, and not be able to identify the sounds or understand their meaning (despite being able to hear the sounds normally). Agnosia is a rare condition, and its clinical presentation borders on the bizarre; nonetheless, careful scientific study of agnosia has provided many important insights into the brain mechanisms important for learning, memory and knowledge retrieval.

1. Types of Knowledge and Levels of Knowledge Retrieval

Before discussing agnosia, it is important to explain some crucial differences in the types of knowledge that are processed by the brain, and how different task demands influence the mechanisms the brain uses to retrieve knowledge. To begin with, there is a dimension of specificity: knowledge can be retrieved at different levels of specificity, ranging from very specific to very general. Consider the following example: Knowledge about a unique horse ('Little Buck,' a sorrel roping horse) is specific and unique, and is classified at the subordinate level; less specific knowledge about horses (four-legged animals that gallop, used by cowboys; of which Little Buck is an example) is classified at the basic object level; and even less specific knowledge about living things (things that have life, of which horses and Little Buck are examples) is classified at the superordinate level.

Pragmatically, the level at which knowledge is retrieved depends on the demands of the situation, and those demands are different for different categories of entities. In everyday life, for example, it is mandatory that familiar persons be recognized at the unique level—e.g., that's 'President Clinton,' or that's 'my father Ned.' It is not sufficient, under most conditions, to recognize such entities only at more nonspecific levels—e.g., that's a 'world leader,' or that's 'an older man.' For other types of entities, recognition at the basic object level is sufficient for most purposes—e.g., that's a 'screwdriver,' or that's a 'stapler'; here, there is no need to recognize individual, unique screwdrivers and staplers in order for practical interactions with the entity to be productive.

One other critical distinction is between recognition, on the one hand, and naming, on the other. The two capacities are often confused. It is true that recognition of an entity, under normal circumstances, is frequently indicated by naming (e.g., 'stapler'; 'Little Buck'; 'siren'). However, there is a basic difference between knowing and retrieving the meaning of a concept (its functions, features, characteristics, relationships to other concepts), and knowing and retrieving the name of that concept (what it is called); moreover, this difference is honored by the brain. For example, brain damage in the left inferotemporal region can render a patient incapable of naming a wide variety of stimuli, while leaving unaffected the patient's ability to recognize those stimuli (H. Damasio et al. 1996). For the