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Canadian Longitudinal Study on Aging: A Platform for Psychogeriatric Research

Vanessa Taler[1], Christine Sheppard[2,3], Parminder Raina[4] and Susan Kirkland[5]
[1]University of Ottawa and Bruyère Research Institute, Ottawa, ON, Canada
[2]University of Waterloo, Waterloo, ON, Canada
[3]Bruyère Research Institute, Ottawa, ON, Canada
[4]Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, ON, Canada
[5]Departments of Community Health & Epidemiology and Medicine, Dalhousie University, Dalhousie, NS, Canada

Synonyms

CLSA; Cohort; Cognition; Mood; PTSD; Personality traits; Depression; Psychopathology

Definition

The recently launched CLSA is the largest and most comprehensive study of aging ever undertaken in Canada. Through its innovative design and advanced data collection methods, the study provides a unique opportunity to examine the aging process and factors that shape healthy aging. After describing the study design of the CLSA, an overview of the measures used to assess psychological functioning is provided. The chapter concludes with a discussion of how the CLSA provides a unique opportunity to investigate the internal and external factors that influence psychological functioning in mid- to late-life.

Introduction

The ability to maintain autonomy, perform everyday activities, and engage in society is highly dependent on the level of psychological functioning, and this relationship is magnified with age. Changes in cognitive functioning are a component of normal aging and begin in mid-life or even earlier. While some higher brain functions (e.g., processing speed) are highly sensitive to age-related change, other abilities are well preserved in healthy aging (e.g., comprehension of word meaning) (Park and Schwarz 2000). Changes may also be observed in the "pragmatics" of cognitive functioning, which are largely captured under the rubric of social cognition (i.e., how we perceive and interpret our world) (Baltes 1993).

Noted at end of chapter On behalf of the CLSA Psychology Working Group (Table 2).

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Identifying the links between personality variables and wellness is also emerging as a predominant research topic. Research reveals complex associations between personality and well-being, both physical and mental. In part, these associations appear to be a function of the link between personality traits, mood states, and psychopathology and the resulting effects upon physical wellness. For example, negative emotional states appear to have a significant influence upon biological functions such as immune function and regulation (which become less efficient in later life), thus increasing the risk of many health problems (Kiecolt-Glaser and Glaser 2002).

Longitudinal research is critical in order to achieve a clear understanding of age-related changes in psychological function and the links between psychological function and wellness. The Canadian Longitudinal Study on Aging (CLSA) will follow 50,000 adults aged 45–85 for at least 20 years, collecting critical information on psychological and social function, as well as indices of physical and mental well-being. This will allow for examination of psychological processes as precursors and mediators in relation to measures of social, biological, psychological, and adaptive functioning (e.g., social participation, diseases, everyday functioning).

The Canadian Longitudinal Study on Aging

The recently launched CLSA is the largest and most comprehensive study of aging ever undertaken in Canada. Through its innovative design and advanced data collection methods, the study provides a unique opportunity to examine the aging process and the factors that shape healthy aging. The goal is to better understand the complex interplay among the many determinants of health through the examination of influences "from cells to society," providing the most accurate picture possible of the dynamic process of adult development and healthy aging. By collecting information on the changing biological, medical, psychological, social, lifestyle, and economic aspects of people's lives as they age, the CLSA will contribute to the identification of modifiable factors that can be used to develop interventions to improve the health of Canadians.

Most previous large-scale adult development and aging studies that address psychology have focused on the development of specific psychological processes such as memory and intelligence or have been conducted in the context of specific disorders, such as dementia. The CLSA will expand this domain of research by examining several psychological constructs as precursors or mediators of specific and global aspects of health and health-related outcomes. This chapter describes the study design and measures included in the CLSA, with particular emphasis on those that are focused on the assessment of the transitions and trajectories of psychological functioning over the latter half of the adult life course.

Methods

CLSA Study Design

An overview of the CLSA design and methodology was published in a special supplement to the *Canadian Journal of Aging* (Raina et al. 2009a). Additional papers describing the recruitment strategy (Wolfson et al. 2009), methods for ascertainment of chronic disease (Raina et al. 2009b), study feasibility (Kirkland et al. 2009), feasibility of biological sample collection (Balion et al. 2009), and linkage with health-care utilization databases (Raina et al. 2009c) were also included. The CLSA is a prospective cohort study of 50,000 residents of Canada aged 45–85 years at baseline and followed for at least 20 years. Of the 50,000 participants, 20,000 provided data through computer-assisted telephone interviews (CATI), and the remaining 30,000 participated in data collection that included an in-home interviewer-administered questionnaire and a comprehensive physical assessment at a dedicated data collection site. Major data collection is repeated every 3 years and in between waves, a short maintaining contact telephone interview is conducted in order to minimize the loss to follow-up and also to collect additional data as needed.

Canadian Longitudinal Study on Aging: A Platform for Psychogeriatric Research, Table 1 (continued)

Measures	Cohort (n = 50,000)	
	Comprehensive face to face (n = 30,000)	Telephone interview (n = 20,000)
Functional performance (grip strength, timed up and go, balance, gait)		
Basic activities of daily living	Q	Q
Instrumental activities of daily living	Q	Q
General health	Q	
Life space index	Q	Q
Women's health	Q	Q
Chronic conditions	Q	Q
Health-care utilization	Q	Q
Medication use	Q	Q
Dietary supplement use	Q	Q
Oral health	Q	Q
Injury and falls	Q	Q
Pain and discomfort	Q	Q
Sleep	Q	
Biological measures		
Blood	Collected	
Urine	Collected	
Social measures		
Social networks	Q	Q
Online social networking	Q	Q
Social support availability	Q	Q
Social participation	Q	Q
Care receiving (formal care)	Q	Q
Care receiving (informal care)	Q	Q
Caregiving	Q	Q
Retirement status	Q	Q
Preretirement labor force participation	Q	Q
Labor force	Q	Q
Retirement planning	Q	Q
Social inequality	Q	Q
Wealth	Q	Q
	Q	Q

(*continued*)

Canadian Longitudinal Study on Aging: A Platform for Psychogeriatric Research, Table 1 CLSA baseline measures

Measures	Cohort (n = 50,000)	
	Comprehensive face to face (n = 30,000)	Telephone interview (n = 20,000)
Psychological measures		
Memory		
Rey auditory verbal learning test	Q	Q
Executive function		
Mental alteration test	Q	Q
Prospective memory test	Q	
Stroop neuropsychological screening test	Q	
Controlled oral word association test	Q	
Animal naming	Q	Q
Psychomotor speed		
Simple and choice reaction times	T	
Mood and psychopathology		
Depression	Q	Q
Life satisfaction	Q	Q
Post-traumatic stress disorder	Q	Q
Psychopathology	Q	
Personality traits	Q	Q
Physical measures		
Lean muscle mass and body composition	PE	
Waist and hip circumference	PE	
Blood pressure	PE	
Bone density	PE	
Aortic calcification	PE	
Lung function	PE	
Electrocardiogram (ECG)	PE	
Carotid intima-media thickness	PE	
Vision	PE and Q	Q
Hearing	PE and Q	Q
Weight and height	PE	Q
Functional status	PE	Q
	PE	

(*continued*)

Canadian Longitudinal Study on Aging: A Platform for Psychogeriatric Research, Table 1 (continued)

Measures	Cohort (n = 50,000)	
	Comprehensive face to face (n = 30,000)	Telephone interview (n = 20,000)
Transportation, mobility, migration		
Built environment	Q	Q
Lifestyle and behavior		
Physical activity	Q	Q
Nutritional risk		Q
Nutritional intake	Q	
Tobacco use	Q	Q
Alcohol use	Q	Q

Q: assessed via questionnaire (either telephone or face-to-face administration)
T: measured using a performance test involving an interactive computer touch screen
PE: measured by physical examination at the data collection site

In addition to the psychological assessment, a vast array of common core information is collected through questionnaires (Table 1). For the 30,000 members of the CLSA who undergo face-to-face assessment, the core information is supplemented by additional interview questionnaires about diet, medication use, chronic disease symptoms, and sleep disorders. Measures collected at the data collection site include tests of physical function (e.g., grip strength and 4-m walk test), anthropometrics (e.g., height and weight), and clinical status (e.g., vision and hearing) as well as cognitive function. Each participant also provides a blood and urine sample and signed consent to link their data to provincial health-care databases. In collaboration with Health Canada, air pollution exposures have been estimated for each participant in the CLSA. For the baseline, core chemistry biomarkers are available on all 30,000 participants, gene-wide genotyping on 10,000 participants, and targeted epigenetics on 5,000 participants. The data collection has been further expanded for the first follow-up of the CLSA to include measures of child maltreatment, elder abuse, hearing handicap inventory, oral health, subjective memory, meta-memory, gender identity, health-care access, and unmet needs as it relates to health-care delivery.

Psychological Measures Within the CLSA

Expert working groups selected psychological, physical, biological, social, and lifestyle measures for inclusion in the CLSA. Measures were selected based on their relevance to adult development and aging, availability in English and French, psychometric properties (e.g., sensitivity and specificity), and feasibility in terms of the time to administer, the cost, and the need for unique resources or equipment. Table 1 presents a summary of the measures included at baseline and at the first follow-up. Furthermore, based on algorithms based on information from disease symptom questions and medication use, the CLSA is able to ascertain whether participants have a number of chronic diseases including cardiovascular diseases; diabetes; hypertension; cerebrovascular disease; arthritis of the knee, hip, and hands; osteoporosis; respiratory diseases such as COPD; hyper- and hypothyroidism; dementia including Alzheimer's disease and Parkinson's disease; and depression.

In CLSA, several instruments measuring various domains of psychological aspects of aging were used at baseline. These domains include cognition (memory, executive function, and psychomotor speed), mood, psychopathology, post-traumatic stress disorder (PTSD), depression, and personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism).

Cognition

Cognition may be defined in terms of domains (e.g., memory, executive functions, speed of processing), each of which can be further characterized into component processes. Age-related changes are observed in many of these domains and processes; for example, robust age-related changes are observed in processing speed, whereas other domains, such as semantic memory (knowledge about facts and concepts in the world), remain relatively intact with aging. There can be great intraindividual variability within a testing session or across testing sessions, and

there is reason to believe that marked variability may be predictive of early cognitive impairment.

Participants in the CLSA Comprehensive cohort are assessed in three domains of cognitive function: memory, executive function, and psychomotor speed. The cognitive battery takes approximately 27 min to administer. CLSA telephone-based participants are assessed in two domains of cognitive function, memory and executive function, by telephone only (approximately 8 min to administer).

Memory

Rey Auditory Verbal Learning Test (RAVLT) (Trial 1 and Delay Trial). The RAVLT (Rey 1964) is a 15-item word learning test that assesses both learning and retention. The list of words is read at the rate of one per second, and the participants' responses are recorded. One learning trial and one delayed recall trial (with a delay of 30 min) are used. The RAVLT has been shown to be extremely sensitive in detecting early cognitive decline.

Executive Function

Mental Alternation Test (MAT). The MAT (Himmelfarb and Murrell 1983) comprises two parts, A and B. Part A requires participants to count aloud from 1 to 20 and to say the alphabet as quickly as possible; the purpose is to ensure that participants can perform Part B. If a participant is unable to perform these tasks, then the MAT cannot be administered. In Part B, the participant is asked to alternate between number and letter (i.e., 1-A, 2-B, 3-C . . .) as quickly as possible for 30 s. The number of correct alternations in 30 s, discounting any errors, determines the score, which ranges from 0 to 51. The MAT is highly sensitive and specific for detecting cognitive impairment.

Prospective Memory Test (PMT). The PMT (Lowenstein and Acevedo 2001) contains both event-based and time-based prospective memory tasks that are cued after either 15- or 30-min delays. The scoring system is based on three criteria: intention to perform, accuracy of response, and need for reminders. There is increasing evidence that both time-based and event-based prospective memory decline with age and the PMT is sensitive to cognitive impairment.

Stroop Neuropsychological Screening Test (Victoria). The Stroop test (Golden 1978) is a measure of inhibition, attention, mental speed, and mental control. The Golden version (Golden 1978) of the Stroop test has three parts. First, the participant reads a list of words printed in black. In the second part, the participant is asked to name the ink color of printed "X"s. In the third part (interference condition), the participant is asked to quickly name the color of the ink in which color words are written in (e.g., say "blue" for the word "green" written in blue ink). There are 100 items in a trial for this version. Scoring may be by time, error, both, or the number of items read or named within a specified time limit.

Controlled Oral Word Association Test (COWAT). The COWAT (Spreen and Benton 1977) is a measure of verbal fluency based on an orthographic criterion. It requires the time-limited generation of words that begin with a given letter (e.g., participants are asked to name as many words as possible that begin with the letter "F"). Following standard protocols, CLSA administers three 1-min trials with the letters F, A, and S. The score is the total number of admissible words produced.

Animal Fluency Test. The animal fluency test (Himmelfarb and Murrell 1983) is a measure of verbal fluency based on a semantic criterion. Participants are required to name as many animals as possible in 60 s.

Psychomotor Speed

Computer-administered simple and choice reaction time tests (West et al. 2002) were used to assess psychomotor speed.

Choice Reaction Time (CRT) (Computer-Administered Test). In this test, participants receive a warning stimulus consisting of a horizontal row of four plus signs on a computer

screen. After a delay of 1,000 ms, one of the plus signs changes into a box. The location of the box is randomized across trials. Participants are instructed to touch the interactive computer touch screen at the location of the box as quickly as possible. Although the instructions emphasize speed, participants are also instructed to minimize errors. The measures used are the latencies and percent correct for the 52 test trials (there are 10 practice trials).

Choice Reaction Time 1-Back (CRT-1) (Computer-Administered Test). This task uses the same stimulus display and computer touch screen as the CRT. However, in this version of the task, when the plus sign changes into a box, participants are instructed to touch the screen at the location where the box appeared on the previous trial as quickly as possible. A total of 10 practice trials and 52 test trials are administered.

Mood and Psychopathology

Current research indicates complex associations between positive and negative mood states, psychopathology, and physical and mental well-being (O'Rourke 2002; Watson and Pennebaker 1989). Negative emotional states in themselves may increase susceptibility to an array of health conditions and are associated with poorer prognoses. For example, negative emotions appear to influence immune function and regulation (which become less efficient in later life), thus increasing the risk of a myriad of health conditions (Kiecolt-Glaser et al. 2002).

Social science research has been criticized for equating well-being with the absence of psychopathology (Stroller and Pugliesi 1989; Stull et al. 1994). In other words, persons deemed to be free of psychiatric distress were assumed to be well, happy, or satisfied with life. Implicit in such studies was the assumption that emotional experience existed along a single continuum. However, more recent research indicates that psychological well-being and psychopathology (and their correlates) are separable phenomena (Ryff et al. 1998). Therefore, to assume the existence of one on the basis of the absence of the other is empirically unsupported; both need to be assessed in order to arrive at a balanced understanding of emotional wellness.

Negative Mood State

Depressive symptoms are measured in the CLSA Tracking and Comprehensive cohorts using the short form of the Center for Epidemiologic Studies Depression (CES-D10) Scale (Andresen et al. 1994), which takes approximately 3 min to administer and has been used extensively in large studies.

Positive Mood State (Life Satisfaction)

Life satisfaction is measured using the Satisfaction with Life Scale (SWLS) (Diener et al. 1985), which comprises five questions and takes about 90 s to administer. The SWLS is one of the most widely used scales to measure the life satisfaction component of subjective well-being.

Post-traumatic Stress Disorder (PTSD)

The lifetime prevalence of PTSD in Canada has been estimated at 9.2 %. The CLSA includes the four-item primary care PTSD (PC-PTSD) screening instrument (Pins et al. 2003), which takes about 30 s to administer. The CLSA has included this short tool as part of the CLSA Veterans Health Initiative, in which all CLSA participants are asked a set of veteran identifier questions.

Psychopathology

Nonspecific psychological distress is measured using the Kessler Psychological Distress Scale (K10) (Kessler et al. 2002), which was developed using the item response theory to maximize discriminant ability at the severe range of psychological distress. The K10 is becoming one of the most widely used screens for psychological distress in epidemiological surveys. It takes approximately 2 min to administer and is included only in the Comprehensive Maintaining Contact questionnaire.

Personality Traits

Personality traits are "enduring patterns of perceiving, relating to, and thinking about oneself and the environment that are exhibited in a wide range of social and personal contexts" (American Psychiatric Association 1994). The Big Five

personality traits are five broad domains of personality (openness, conscientiousness, extraversion, agreeableness, and neuroticism) that have been extensively studied and are related to self-rated health. The CLSA measures personality traits using the Ten-Item Personality Inventory (TIPI) (Gosling et al. 2003), which takes approximately 1 min to administer and is included only in the Comprehensive Questionnaire.

All the measures described above and in Table 1 will be repeated in each follow-up wave of the CLSA, providing a rich source of information on changing risk factors as well the changing nature of disease, function, and psychosocial outcomes. However, the CLSA also provides the opportunity to add new measures in each of the follow-up waves to investigate new and emerging areas of research. As noted previously, a new psychological measure of subjective cognitive decline has been added to the follow-up assessment. Complaints about memory are extremely common in middle-aged and older people. While these complaints can occur in the setting of cognitive disorders such as mild cognitive impairment or a dementia, they are also common in individuals without an overt cognitive disorder. The CLSA is an ideal vehicle to explore the natural history, risk factors, and conditions associated with subjective cognitive decline. The Multifactorial Memory Questionnaire (Troyer and Rich 2002) will be used to assess self-reported cognitive ability in everyday life. This reliable and valid measure examines subjective cognitive complaints to capture preclinical signs of cognitive impairment and has been validated in both English and French. Two additional questions have been included to capture perceived change in memory and whether this perceived memory change worries participants.

Psychological Factors as Precursors, Mediators, and Outcomes

The CLSA provides a unique opportunity to investigate the multitude of internal and external factors that influence the trajectory of psychological functioning from mid- to late life. These factors may act as **precursors** related to increased risk of illness. It is known that psychological variables such as depressive symptomatology can influence the onset and progression of illness. Research in the area of stress and psychoneuroimmunology speaks to these interrelations. CLSA provides the opportunity to examine stress-disease relationships in a large representative sample of Canadians. Similarly, CLSA data can be used to investigate questions where cognitive changes function as precursors to disease states. For example, is decline in cognitive functioning in mid- and later life associated with subsequent adverse health-related (or biological) outcomes (e.g., diagnosis of dementia, diagnosis of vascular disease, sleep fragmentation, or sleep disturbance)?

Psychological, social or environmental, and biological factors may also serve as **mediators** between illness and health outcomes. There is ample evidence that psychological characteristics such as attitudes are related to recovery from illness (Institute of Medicine Committee on Assessing Interactions Among Social BaGFiH et al. 2006). Similarly, environmental context can influence response to treatment and health outcomes (Institute of Medicine Committee on Assessing Interactions Among Social BaGFiH et al. 2006). CLSA will provide a unique opportunity to address research questions where cognitive performance functions as a mediator between biological and functional status, such as: How do cognitive functions mediate relations between biological/health status and adaptive functioning and/or social participation (e.g., what are the underlying mechanisms involved)?

As might be expected, there are numerous factors that influence health **outcomes** at different points in the life span. Cognition and disorders of cognition can be viewed as psychological outcomes that may be related to a number of different precursors and mediators. These changes in cognitive functioning occur in relation to aging and, as noted, may be influenced by many other factors including biological, psychological, and social factors. Thus, CLSA data may be used to address research questions such as: Are changes over time in cognition (memory, executive function, and psychomotor speed) associated with specific biological states and/or lifestyles?

Canadian Longitudinal Study on Aging: A Platform for Psychogeriatric Research, Table 2 Authorship: CLSA Psychology Working Group

Last name	First name	Title	Degree	Affiliation
Tuokko	Holly		Ph.D.	University of Victoria
Carrier	Julie	Professeure titulaire		Université de Montréal
Davidson	Patrick	Associate Professor	Ph.D.	University of Ottawa
Doiron	Maxime		Ph.D. research candidate	
Dupuis	Kate	Postdoc fellow	Ph.D., C.Pysch.	Baycrest and University of Toronto
Gagliese	Lucia	Associate professor	Ph.D.	York University
Hadjistavropoulos	Thomas		R.Psych., Ph.D.	University of Regina
Hofer	Scott	Director		University of Victoria
Ingles	Janet	Associate professor	Ph.D.	School of Human Communication Disorders
Jutai	Jeffrey	Professor	M.Sc., Ph.D.	Interdisciplinary School of Health Sciences
Loken Thornton	Wendy	Associate professor	R.Psych, Ph.D.	Simon Fraser University
Lorrain	Dominique	Professeure titulaire	Ph.D.	Université de Sherbrooke
MacDonald	Stuart	Assistant professor	Ph.D.	University of Victoria
O'Connell	Megan	Assistant professor	R.Psych., Ph.D.	University of Saskatchewan
Pichora-Fuller	Kathy	Professor		University of Toronto Mississauga
Ritchie	Lesley	Assistant professor		University of Manitoba
Simard	Martine	Professor	Ph.D.	Université Laval
Smart	Colette			University of Victoria
Taler	Vanessa	Associate Professor	Ph.D.	University of Ottawa
Tierney	Mary		Ph.D.	Sunnybrook Hospital

CLSA as a Data Platform for Research

Data and Sample Access

A fundamental principle of the CLSA is to provide the research community with the collected data while protecting the privacy and confidentiality of study participants. The Data and Sample Access Committee (DSAC) reviews all applications for the use of CLSA data and is responsible for monitoring the approved applications for progress. Exclusive access to the platform cannot be granted to any applicant. Users are entitled to use the CLSA platform (i.e., data and/or biospecimens) only for the duration and purposes of the approved research as presented in the application. The user is not entitled to publish or otherwise disseminate any CLSA data, any assay data, or any derived variable data at the individual participant level.

Cross-References

- Aging and Psychosocial Wellbeing
- Age-related Changes in Abilities
- Australian Longitudinal Study of Aging (ALSA)
- Big Five Personality Structure and Aging

- Cognition
- Depression
- English Longitudinal Study of Aging
- Irish longitudinal Study on Aging (TILDA)
- Longitudinal Aging Study Amsterdam
- Life and Living in Advanced Age in New Zealand (LiLACS)
- Life Span Developmental Psychopathology
- PTSD and Trauma
- Theories of Resilience and Aging
- The Integrative Analysis of Longitudinal Studies of Aging (IALSA)

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