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Are early onset aging conditions correlated to daily activity functions in youth and adults with Down syndrome?

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ABSTRACT

This study aims to answer the research question of "Are early onset aging conditions correlated to daily activity functions in youth and adults with Down syndrome (DS)?" A cross-sectional survey was employed to recruit 216 individuals with DS over 15 years of age in the analyses. A structured questionnaire included demographic data, brief self-reported aging conditions, Dementia Screening Questionnaire for Individuals with Intellectual Disabilities (DSQIID) and activity of daily living (ADL) scales were completed by the primary caregivers who were well-suited for providing information on the functioning conditions of the DS individuals. Results showed that the most five frequent aging conditions (sometimes, usually and always) included frailty (20.2%), vision problem (15.8%), loss of language ability (15.3%), sleep problem (14.9%) and memory impairment (14.5%). Other onset aging conditions included more chronic diseases (13.9%), hearing loss (13%), chewing ability and tooth loss (12.5%), incontinence (11.1%), depressive syndrome (7.7%), falls and gait disorder (7.2%), loss of taste and smell (7.2%). The data also showed scores of DSQIID, onset aging conditions and ADL has significant relationships each other in Pearson's correlation tests. Finally, multiple linear regression analyses indicated onset aging conditions ($\beta = -0.735$, $p < 0.001$) can significantly predicted the variation in ADL scores after adjusting other factors ($R^2 = 0.381$). This study suggests that the authority should initiate early intervention programs aim to improve healthy aging and ADL functions for people with DS.

1. Introduction

Improvements in health and social care for people with intellectual disability (ID) have led to a dramatic increase in the life expectancy of this population, resulting in a large and growing number of older adults with ID (Sinai, Bohnen, & Strydom, 2012). Down syndrome (DS) is one of many causes of ID and it is characterized by a number of neurobiological problems

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resulting in learning and memory deficits and early onset Alzheimer's disease (Ruparelia, Pearn, & Mobley, 2013). Many other health problems, such as congenital heart disease, leukemia, hypotonia, motor disorders, and various physical anomalies occur at an elevated frequency in people with DS (Patterson, 2009).

Previous studies confirmed that dementia is common in older adults with DS, and that the prevalence increases sharply from the age of 40 until the age 60 (Coppus et al., 2006; Margallo-Lana et al., 2007; Strydom et al., 2009). Alzheimer's disease (AD) is particularly common in elder adults with DS, but is not a certainty as originally thought, some 20–30% of elder adults with DS might never show any, or at most mild signs of AD (Zigman, 2013). Lott and Lai (1982) observed the clinical manifestations of dementia in 15 DS patients aged 32–64 years, they found that all of the patients showed personality changes and loss of independent daily living skills, the presenting symptoms in two thirds of the cases. Other manifestations included seizures, gait deterioration, sphincteric incontinence, and pathological release reflexes.

However, patients with DS who have legitimate, treatable diagnoses may be misdiagnosed as having behavior problems or dementia. Failure to identify abnormalities such as cardiac problems or sleep apnea may shorten life and interfere with ability to live life to the fullest (Bosch, 2003). Similar concerns may also be observed during adulthood by accelerated aging and the threat of Alzheimer disease in some persons with DS. Special attention needs to be paid to these disorders and conditions during the lifetime of a person with DS (Pueschel, 1990).

Adults with DS are often physically inactive, which may accelerate the onset of disease and aging symptoms (Carmeli, Ariav, Bar-Yossef, Levy, & Imam, 2012). Our previous study indicated that 2.3% of adults with ID aged 45 years and older were in total dependence and 11.9% were in severe dependence, 27.9% were in moderate dependence, 8.1% had a mild dependence, and those with lower educational level, comorbid Down's syndrome, and severe disability level are the variables able to significantly predict ADL score (Lin, Hsia, et al., 2013). To meet the needs of aging people with DS, it is necessary to evaluate the aging-related changes and their functional abilities in daily living. Therefore, the aims of this study were to investigate the functional profile that occurs as a result of aging by evaluating the activities of daily living, early onset aging conditions and dementia score differences in younger and older persons with DS.

2. Methods

The present study analyzed data from a cross-sectional survey "Healthy Aging Initiatives for Persons with an Intellectual Disability in Taiwan: A Social Ecological Approach (II) People with Down Syndrome" (Lin, Lin, et al., 2013). The study population comprised 758 DS individuals over 15 years of age who were recruited from the voluntary registry members of the Republic of China Foundation for Persons with Down Syndrome. Details on the study population and the sample have been described in a previous study (Lin et al., 2014a). A total of 245 questionnaires were completed by the primary caregivers who were well-suited for providing information on the functioning conditions of the DS individuals. Finally there were 216 valid questionnaires (39 respondents did not meet the data criteria) were entered into a database and analyzed using SPSS 20.0 software.

The present study used the Barthel Index (BI) of ADL to determine a baseline level of physical functioning in people with DS. For the aging changes of individuals with DS, the study used a brief self-reported aging condition questionnaire (12 items, see Table 1) and a Dementia Screening Questionnaire for Individuals with Intellectual Disabilities (DSQIID) scale to determine the early-onset dementia conditions in people with DS. The detail descriptions of ADL and DSQIID and their distributions have been described in our previous publications (Lin et al., 2014a,b).

The statistical methods of this study included numbers, means, percentages, range, and standard deviations to describe demographic characteristics, disease conditions, aging phenomena, dementia and ADL scores for individuals with DS. Additionally, a *t*-test, ANOVA, and Scheffe's test were used to examine the relationships between the demographic characteristics, disease conditions, aging condition and ADL scores of the participants. Multiple linear regression methods were used to examine aging conditions that influenced the ADL scores after controlling other factors in individuals with DS.

Table 1
Distributions of onset aging conditions of people with DS ($n = 208$).

Onset aging conditions	Never	Sometimes	Usually	Always
	n (%)	*n* (%)	*n* (%)	*n* (%)
Hearing loss	181 (87.0)	21 (10.1)	2 (1.0)	4 (1.9)
Vision problem	175 (84.1)	20 (9.6)	10 (4.8)	3 (1.4)
Incontinence	185 (88.9)	22 (10.6)	1 (0.5)	0 (0)
Falls and gait disorder	193 (92.8)	15 (7.2)	0 (0)	0 (0)
Chewing ability and tooth loss	182 (87.5)	16 (7.7)	7 (3.4)	3 (1.4)
Memory impairment	178 (85.6)	22 (10.6)	6 (2.9)	2 (1.0)
Frailty	166 (79.8)	29 (13.9)	7 (3.4)	6 (2.9)
Loss of taste and smell	193 (92.8)	11 (5.3)	1 (0.5)	3 (1.4)
Loss of language ability	176 (84.6)	14 (6.7)	3 (1.4)	15 (7.2)
More chronic diseases	179 (86.1)	24 (11.5)	4 (1.9)	1 (0.5)
Sleep problem	177 (85.1)	21 (10.1)	6 (2.9)	4 (1.9)
Depressive symptoms	192 (92.3)	16 (7.7)	0 (0)	0 (0)

Eight missing data.