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Oral Health-Related Quality of Life and Life-Space Mobility in Community-Swelling Older Adults

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Abstract

Objectives—To quantify the associations between measures of oral health-related quality of life (OHRQoL) and life-space mobility (LSM) in community-dwelling older adults.

Design—Cross-sectional study using a 54-item OHRQoL questionnaire.

Setting—Five counties in central Alabama: Jefferson and Tuscaloosa (urban), and Bibb, Hale, and Pickens (rural).

Participants—The 288 Dental Study volunteers were recruited from participants in the University of Alabama at Birmingham Study of Aging, a longitudinal study of mobility in community-dwelling adults age 65 and older.

Measurements—Participants completed an in-home interview about their OHRQoL and LSM. Life-space was assessed by asking questions about where, how often, and the degree of independence in getting to areas ranging from the home to beyond town. Unadjusted and adjusted regression models were used to quantify associations between OHRQoL and LSM. Other factors examined included: age, race, gender, income, education, residence, transportation difficulty, marital status, depressive symptoms, and comorbidity.

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Results—Unadjusted and adjusted analyses suggested significant associations between OHRQoL and LSM in these components of oral health: oral functional limitation, oral pain and discomfort, oral disadvantage, and self-rated oral health.

Conclusion—OHRQoL decrements reported by participants were associated with decreased LSM, suggesting that perceptions of oral well-being have a significant impact on mobility and the social participation of older adults.

Keywords

oral health; quality of life; life-space mobility; geriatric assessment

INTRODUCTION

It has been projected that the number of adults aged 60 or older will triple during the next 50 years to nearly 2 billion, making for the first time that population larger than the population of children.¹ The prevalence of oral health problems increases with age, highlighting the importance of oral health-related quality of life (OHRQoL), a concept that reflects aspects of human life generally affected by oral health or dental care. It is clear that oral health problems affect the daily lives of older adults.² Perception of oral well-being, or lack thereof, can affect social and physical oral functioning³ which, in turn, can have a substantial influence on an individual's over-all quality of life^{3–5} and impact their daily activities, including mobility.²

The University of Alabama at Birmingham (UAB) Study of Aging Life-Space Assessment Composite Score has been validated as a measure of community mobility and social participation, which are important domains of quality of life for older adults.^{6–7} The life-space assessment goes beyond evaluating difficulties with specific mobility-related tasks such as walking, stair climbing, or using transportation. It reflects the distance, frequency, and independence of persons' movement in their environment during the month before the assessment. The composite life-space score, which ranges from 0 to 120, has been shown to predict mortality⁸ and cognitive function⁹ and is sensitive to changes in health status associated with hospitalizations.¹⁰ Correlates and predictors of life-space mobility (LSM) include socioeconomic factors, as well as measures of physical and mental health.^{11–13}

Although numerous studies have separately investigated OHRQoL^{14–17} and LSM^{6–7,10,12–13}, to the authors' knowledge, this is the first study to focus on a potential relationship between the two in community-dwelling older adults. The analyses accounted for key non-oral health factors that have previously been shown to influence or be related to LSM (e.g. race, gender, residence, education, income, marital status, transportation difficulty, comorbidity, and depressive symptoms).^{6–7,10–11,13} The purpose of this study was to test the hypothesis that there is an association between self-reported decrements on measures OHRQoL and LSM in community-dwelling older adults.

METHODS

Study sample

Volunteers for the Dental Study were recruited from participants in the UAB Study of Aging (the "Parent Study"), a longitudinal study of 1000 community-dwelling older adults, stratified by race, gender, and residence. The UAB Study of Aging participants were recruited from a random sample of Medicare beneficiaries 65 years old and older living in five counties of central Alabama: Jefferson and Tuscaloosa (urban), and three non-metropolitan rural counties (Bibb, Hale, and Pickens) with populations in the lowest quartile

of Alabama counties (less than 21,000 persons per county). These five counties had a proportion of African American (AA) residents ranging from 20–65%. The study protocol was reviewed and approved by the UAB Institutional Review Board.

Recruitment for the UAB Study of Aging was initiated by an introductory letter mailed to 3100 people, followed by a telephone contact. Of 2186 persons contacted to arrange in-home assessments, 1143 (52.3%) refused and 43 (2.0%) were ineligible because the individual did not live in one of the five counties studied, were under the age of 65, or were unable to communicate on the telephone to make arrangements for the in-home assessment.¹³ Telephone follow-up interviews were conducted every 6 months through April 2009.^{13,18–19}

Study sample from the Study of Aging “Dental Study”—Between the 30- and 36-month follow-up telephone interviews, participants were offered the opportunity to participate in an oral health examination and interview. Of the 876 participants interviewed during this time, 523 (59.7%) granted permission to be contacted about the Dental Study. Of those, 291 (55.6%) participated in the Dental Study. Three participants, who were edentulous and without dentures and were excluded from the final analysis; 288 participants are used in these analyses.

The dental interview, consisting of 54-item questions addressing oral disease and tissue damage, oral pain and discomfort, oral functional limitation, oral disadvantage, and self-rated oral health, was administered at the participant’s homes or by telephone.

Study variables

Measures of Oral Health-Related Quality of Life—Self-reported oral disease and tissue damage was defined as anatomical loss, structural abnormality or disturbance in physiological or biochemical processes present at birth or resulting from injury or disease. Examples would be dental decay, missing teeth, periodontal (gum) loss, cusp fractures, root fragments, tooth mobility, and mucosal lesions. Self-reports of infection, sore gums, abscessed teeth, and broken teeth were some of the factors used to quantify this component of oral health.

Oral pain & discomfort was defined by self-reported pain and discomfort including toothache, tooth sensitivity, denture soreness, soreness during chewing, and pain caused by mucosal lesions.

Oral functional limitation was defined as a restriction in the functions customarily expected of the mouth such as ability to chew.

Oral disadvantage refers to the psychosocial impacts of oral disease, pain, discomfort, or functional limitation on individuals because they cannot or do not meet expectations of the societal groups to which they belong, all of which were included in the questionnaire. Examples would be avoiding conversation, laughing, or smiling because of unattractive or diseased teeth or gums, and avoiding eating with other people because of chewing difficulty or embarrassment.

Self-rated oral health was measured by the participant’s overall assessment of his or her oral health, which may be influenced by the presence of oral diseases and conditions, oral pain, oral functional limitation, and/or oral disadvantage. Another component of self-rated oral health was satisfaction with oral health. Satisfaction was measured by self-reported content with one’s ability to chew, dental appearance, and overall mouth health. The perceived need for dental care reflected a participants’ assessment of their need to see a

dentist now or in within the next few weeks. In addition, we asked participants further questions about whether they had ever had a full or partial denture or plates for their upper and lower jaws.

A table describing the measures of oral health and OHRQoL in the questionnaire administered to participants can be found at:
<http://www.aging.uab.edu/SubChannel/Research/uab-study.aspx>.

Socio-demographic factors—Race, age, gender, residence, education, income, marital status, and transportation difficulty were assessed at baseline. Race was self-reported and divided into two categories: non-Hispanic African American and non-Hispanic White. Age was categorized as 65–74 and 75+. Residence was defined as “urban” (Tuscaloosa and Birmingham counties) and “rural” (Bibb, Hale, and Pickens counties). Education was defined as ≤6th grade, grades 7–11, completed 12th grade, and >12th grade. Income categories were established based on responses to a question about total combined family income before taxes. To define a baseline income category for persons with missing responses for reported income, perceived income adequacy responses corresponding to income categories were used to impute a value.²⁰ The four possible responses to the question about income adequacy corresponded to income ranges as follows: “Income is not enough to make ends meet” was equivalent to \$5,000–\$7,999; “Income gives you just enough to get by on” was equivalent to \$8,000–\$11,999; “Income keeps you comfortable but permits no luxuries” was equivalent to \$16,000–\$19,999; “Income allows you to do more or less what you want” was equivalent to \$30,000 to \$39,000. Marital status was defined as currently married or not. Transportation difficulty was defined by a positive response to either of the following: “Over the past 4 weeks have you had any difficulty getting transportation to where you want to go?” and “Do you limit your activities because you don’t have transportation?”²⁰

Geriatric Depression Scale (GDS)—The Geriatric Depression Scale (GDS)²¹ assessed symptoms of depression at the 30-month telephone follow-up interviews. The fifteen-item short form was used, which has been shown to be both reliable and valid.²¹ The higher the GDS score, the more probable that the subject is experiencing depression: the threshold used to indicate probable depression is a GDS of 5.^{21,22}

Comorbidity Score—A simple count of conditions comprising the Charlson Comorbidity Index was calculated and categorized as 0, 1, or 2 or more conditions. The overall comorbidity score reflects the cumulative increased likelihood of 1-year mortality; the higher the score, the more severe the burden of comorbidity.²³ Participants were asked whether a physician told them they had congestive heart failure, myocardial infarction, valvular heart disease, peripheral artery disease, hypertension, diabetes mellitus, chronic obstructive pulmonary disease or asthma, kidney failure, liver disease, cancer, neurological diseases, or gastrointestinal or gall bladder disease.⁶ Conditions were considered verified if the participant was taking medication for this condition, if the condition was confirmed by a questionnaire sent to the participant’s primary care physician, or listed on hospital or emergency room discharge summary. Only verified conditions were considered for the comorbidity score.

Life-Space—A composite measure of life-space (range 0–120) was used, which combined life-space level, degree of independence, and frequency of attainment.^{6–7} Life-space measures were determined by asking participants “During the past 4 weeks, have you been to other rooms of your home besides the room where you sleep (level 1); to an area outside your home such as your porch, deck, or patio, hallway of an apartment building, or garage (level 2); to places in your neighborhood, other than your own yard or apartment building

(level 3); to places outside your neighborhood, but within your town (level 4); and to places outside your town (level 5)?” They were then asked if they needed assistance from a device or person when they traveled in each level, as well as how often they traveled to that area (choices ranged from less than once a week to daily). The composite score was attained by multiplying the life-space level (1–5), the degree of independence (2=independent, 1.5=assistance from equipment, 1=assistance from another person), and frequency of attainment (1=less than once/week, 2=1–3 times/week, 3=4–6 times/week, 4=daily). We examined the distribution of life-space scores by previously defined categories⁸. A LSM score of ≥ 60 (unrestricted life-space) corresponds well to a person’s ability to get out of one’s neighborhood independently^{7,11} and is strongly correlated with level of social participation and mortality.⁸

Statistical considerations

Analyses were conducted using the PASW statistical software package (formerly SPSS), version 18.0.²⁴ Unadjusted linear regression models were used to evaluate the associations between the responses to the OHRQoL questionnaire and LSM. The effects of potentially confounding variables (age, race, gender, income, education, residence, transportation difficulty, marital status, depressive symptoms, and comorbidity score) were evaluated in the multivariable regression models.

RESULTS

Frequency distributions of sociodemographic and economic factors for the Dental Study Participants are shown in Table 1. More than half of the participants were aged 65–74 (59.4%) and more than 60% were female. When examining residence, marital status, and race, approximately 50% of the sample lived in a rural setting, were married, and were African American. The largest group of participants had an education above 12th grade, and the smallest group had an education level less than the 6th grade. Annual household income was reported by 82% (236/288), so income was imputed for 18%. It was not possible to impute income for one individual. More than 20% of the subjects had an annual income of less than \$8,000 and more than 11% had an income of greater than \$50,000. Most participants did not report transportation difficulty (85%). Mean scores for the comorbidity and geriatric depression scales were 1.44 (0.71 SD) and 2.29 (2.51SD), respectively. The mean life space score was 64.94 (24.60 SD). Life space mobility scores were categorized into four groups shown in Figure 1: (1) 10% of the participants had a life-space score of 0–29; (2) 30% of the participants had an life-space score of 30–59; (3) 36% of the participants had a life-space score between 60–89; and (4) 24% of the participants had a life-space score within the range of 90–120.

Association between OHRQoL and LSM

Unadjusted analysis—Table 2 shows the unadjusted and adjusted results of the associations between OHRQoL decrements and LSM. For the unadjusted analyses, thirty-eight questions, representing all domains of OHRQoL, had statistically significant associations. For the measures of self-reported oral disease and tissue damage, there were statistically significant associations between teeth or dentures that were stained or looked bad and LSM. With regard to oral pain or discomfort, there were significant associations for questions with toothache pain and pain or discomfort when chewing.

Five of the six questions about oral functional limitation resulted in statistically significant associations; the only non-significant response dealt with the ability to chew boiled peas. Eight of the nine questions assessing oral disadvantage due to oral disease or tissue damage were significantly associated with LSM; the one exception of was avoiding going outside

the neighborhood. Oral disadvantage (avoiding normal activities) due to oral pain and discomfort, was significantly associated with LSM, as were all questions assessing oral disadvantage due to function.

Four of six questions about mouth dryness were significantly associated with LSM: limiting the foods eaten, causing any worry or concern, making you uncomfortable when eating in front of other people, and having a bad effect on how food tasted. The final measure of OHRQoL was self-rated oral health. With the exception of one question (perceived need for dental care in the next few weeks), all responses were statistically significant.

Adjusted analysis—The multivariable analyses, which adjusted for race, age, gender, marital status, transportation difficulty, income, comorbidity score, depressive symptoms, and residence, revealed significant relationships between decrements in OHRQoL and poor LSM within four OHRQoL. For oral pain and discomfort, there was a significant positive association with questions asking about teeth being sensitive to hot or cold fluids. There was also a significant association with a question about oral functional limitation, namely the ability to chew raw carrots. Of the seven questions related to oral disadvantage due to function, four had significant associations with LSM even after multivariable adjustment: avoiding eating foods you would like to eat, avoiding eating with other people, cutting food into small pieces, and cooking food longer or differently to make it softer. In addition, the other three questions within this area had associations with LSM that approached significance. Many decrements in the OHRQoL measures of self-rated oral health remained associated with LSM after multivariable adjustment, including self-rated chewing ability, self-rated ability to taste food, and self-rated ability to smell food. Finally, there was a significant association between ever having a lower jaw partial denture and LSM.

DISCUSSION

The purpose of this investigation was to determine if there were associations between measures of OHRQoL and LSM among community-dwelling older adults. The results identified significant associations in the unadjusted regression analyses for all domains of oral health: self-reported oral disease and tissue damage; oral pain and discomfort; oral functional limitation; oral disadvantage due to oral disease/tissue damage, oral pain and discomfort, and function; mouth dryness, and self-rated oral health. In models adjusting for factors known to affect LSM, associations remained significant for oral pain and discomfort, oral functional limitation, oral disadvantage due to function, and self-rated oral health. It is interesting to note that the majority of responses that were significantly associated with poor LSM dealt with function and self-rated oral health. These findings would imply that participants who avoided eating foods they like or eating with other people, and had difficulty with smelling and tasting food, might have a decreased desire to leave their neighborhood or house.

OHRQoL was associated with the distance and frequency of personal movement or travel in this study. A clinical implication of these results is that decrements in OHRQoL not only relate to poor oral health measures such as oral pain and discomfort, oral disadvantage due to function, or self-ratings of oral health, but are also associated with non-dental measures of overall health, specifically mobility and social participation. These findings suggest that is very relevant for physicians to understand their patient's overall health status,²⁵ especially because 25% of those aged 65 and over have not seen a dental professional in the last 5 years.²⁶ Moreover, with increasing age older persons become more likely to visit a physician.²⁵

This study had both limitations and advantages. Questions were self-rated and consequently subjective, but do provide important information about perceptions of OHRQoL in older adults. Previous studies have illustrated that perceived ability to chew, for example, is more salient to key outcomes than actual ability to chew.^{22,27} Consequently, self-reported measures may be more meaningful than clinical measures. The study of self-rated oral health improves our understanding of specific factors used by individuals to rate their oral health. Self-rated oral health is important in studying dental service utilization as well as evaluating dental care effectiveness.^{22,28} Although the sample was from a particular geographic area, participants differed in respect to education, income, marital status, transportation difficulties, and life-space, making it a diverse population.

CONCLUSION

Although the effects of oral disease on daily quality of life functions have been acknowledged^{5,29}, to the authors' knowledge this is the first study to address the association between measures of OHRQoL and LSM in community-dwelling older adults. The results indicated that OHRQoL decrements reported by participants were associated with decreased LSM, suggesting that perceptions of oral well-being may have a significant impact on mobility and the social participation of older adults in the community.

These findings will hopefully be the first step to bridging the gap between the dental and medical communities³⁰ by illustrating that LSM decrements are related to oral function and self-rated oral health, even when accounting for various sociodemographic factors, and factors related to function and self-rated oral health. Many community-dwelling older adults visit their physicians more often than their dentists; therefore, physician's ability to assess these OHRQoL measures and identify these decrements as factors contributing to their mobility may identify such problems and result in a referral to dental services. Performance of these assessments by a physician may reveal critical information which could impact not only a patient's survival but also overall quality of life.

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Figure 1.

Frequency Distribution of Life Space Mobility Scores (n = 288)

*A LSM score of ≥ 60 (unrestricted life-space) corresponds well to a person's ability to get out of one's neighborhood independently, and is strongly correlated with level of social participation and mortality.

Table 1

Distribution of Characteristics among Dental Study Participants n=288

Variable	Number	Percent
Age		
65–74	171	59.4
> 75	117	40.6
Race		
Non-Hispanic White	144	50.0
African American	144	50.0
Gender		
Male	112	38.9
Female	176	61.1
Residence		
Rural	145	50.3
Urban	143	49.7
Education		
≤6 th grade	47	16.3
7–11 th grade	83	28.8
=12 th grade	70	24.3
> 12 th grade	88	30.6
Income		
Less than \$5,000	12	4.2
\$5,000–\$7,999	49	17.0
\$8,000–\$11,999	59	20.5
\$12,000–\$15,999	25	8.7
\$16,000–\$19,999	33	11.6
\$20,000–\$29,999	27	9.4
\$30,000–\$39,999	34	11.8
\$40,000–\$49,999	15	5.2
\$50,000 +	33	11.6
Married		
No	141	49.0
Yes	147	51.0
Transportation difficulty		
No	245	85.1
Yes	43	14.9
Comorbidity Scale, mean (std)	1.44 (0.71)	
Geriatric Depression Scale, mean (std)	2.29 (2.51)	
Life Space Score, mean (std)	64.94 (24.60)	

Table 2

Associations between Oral Health Related Quality of Life and Life-Space Mobility

	Unadjusted			Adjusted*		
	$\beta^{\dagger}$	t-statistic	p-value	$\beta^{\dagger}$	t-statistic	p-value
Self-reported oral disease and tissue damage						
Infected or sore gums	-0.065	-1.108	0.269	0.026	0.548	0.584
Teeth or dentures that are stained or look bad	-0.158	-2.701	0.007	-0.008	-0.162	0.871
Currently using a denture that is broken	-0.090	-1.188	0.236	-0.040	-0.711	0.478
Bad breath	0.015	0.252	0.801	0.079	1.717	0.087
Oral pain/discomfort						
Toothache pain	-0.119	-1.697	0.091	-0.050	-0.859	0.392
Pain/discomfort in teeth when you chew	-0.150	-2.571	0.011	-0.031	-0.664	0.507
Teeth sensitive to hot or cold fluids	-0.157	-2.256	0.025	-0.137	-2.405	0.017
Teeth sensitive to sweets	-0.025	-0.353	0.724	0.086	1.522	0.130
Sores or irritations in your mouth that are painful	-0.099	-1.689	0.092	-0.029	-0.618	0.537
Denture soreness	-0.115	-1.516	0.131	-0.016	-0.287	0.774
Oral functional limitation						
Difficulty speaking or pronouncing words	-0.202	-3.489	0.001	-0.023	-0.472	0.637
Able to chew or bite raw carrots	0.323	5.734	<0.001	0.148	3.098	0.002
Able to chew steak	0.209	3.615	<0.001	0.080	1.685	0.093
Able to chew a whole apple	0.239	4.120	<0.001	0.071	1.466	0.144
Able to chew fresh lettuce	0.237	2.997	0.003	0.116	1.688	0.094
Able to chew boiled peas	0.055	0.324	0.748	-0.113	0.742	0.465
Oral disadvantage due to...						
...oral disease/tissue damage						
Avoided laughing or smiling	-0.153	-2.625	0.009	-0.012	-0.251	0.802
Avoided talking to someone	-0.165	-2.826	0.005	-0.026	-0.555	0.579
Avoided going outside your neighborhood	-0.160	-2.731	0.007	-0.020	-0.437	0.662
Avoided going outside your house	-0.098	-1.672	0.096	-0.063	-1.401	0.162
Uncomfortable eating in front of other people	-0.200	-3.456	0.001	-0.044	-0.907	0.365

	Unadjusted			Adjusted*		
	β^*	t-statistic	p-value	β^*	t-statistic	p-value
Limited contact with other people	-0.266	-4.672	<0.001	-0.088	-1.830	0.068
Embarrassed by appearance or bad condition of mouth	-0.205	-3.534	<0.001	-0.064	-1.342	0.181
Felt depressed	-0.168	-2.877	0.004	-0.056	-1.118	0.265
Felt stressed	-0.137	-2.333	0.020	-0.034	-0.724	0.470
...oral pain and discomfort						
Avoided normal activities	-0.232	-4.028	<0.001	-0.076	-1.583	0.115
Trouble sleeping	-0.081	-1.368	0.172	-0.026	-0.559	0.577
...function						
Avoided chewing hard things	-0.233	-4.050	<0.001	-0.087	-1.848	0.066
Avoided eating foods you would like to eat	-0.257	-4.505	<0.001	-0.123	-2.611	0.010
Avoided eating with other people	-0.253	-4.429	<0.001	-0.101	-2.142	0.033
Cut food into small pieces	-0.245	-4.282	<0.001	-0.104	-2.189	0.029
Cooked food longer or differently to make it softer	-0.310	-5.522	<0.001	-0.119	-2.434	0.016
Reduced the total amount of food that you eat	-0.250	-4.366	<0.001	-0.088	-1.867	0.063
Lost any weight	-0.194	-3.352	0.001	-0.079	-1.707	0.089
Mouth dryness						
Limited the foods you eat	-0.156	-2.664	0.008	-0.008	-0.164	0.870
Caused you any discomfort or pain	-0.041	-0.698	0.486	-0.035	-0.764	0.445
Caused you worry or concern	-0.173	2.964	0.003	-0.063	1.368	0.172
Kept you from socializing	-0.079	-1.347	0.179	-0.048	-1.008	0.314
Made you uncomfortable when eating in front of others	-0.188	-3.236	0.001	-0.065	-1.379	0.169
Had a bad effect on how food tasted	-0.242	-4.211	<0.001	-0.069	-1.441	0.151
Self-rated oral health						
Self-rated chewing ability	-0.218	-3.776	<0.001	-0.102	-2.114	0.035
Self-rated dental appearance when out in public	-0.139	-2.375	0.018	-0.026	-0.544	0.587
Self-rated mouth health	-0.171	-2.929	0.004	-0.002	-0.039	0.969
Self-rated ability to taste food	-0.291	-5.145	<0.001	-0.144	-3.063	0.002
Self-rated ability to smell food	-0.178	-3.063	0.002	-0.141	-3.086	0.002
Satisfaction with chewing ability	-0.143	-2.449	0.015	-0.036	-0.774	0.440

	Unadjusted			Adjusted*		
	$\beta^{\dagger}$	t-statistic	p-value	$\beta^{\dagger}$	t-statistic	p-value
Satisfaction with appearance of teeth in public	-0.171	-2.933	0.004	-0.015	-0.316	0.752
Satisfaction with health of mouth	-0.184	-3.163	0.002	-0.023	-0.478	0.633
Perceived need for dental care in the next few weeks	-0.066	-1.111	0.267	0.066	1.378	0.169
Have you ever had dentures or plates	-0.145	-2.469	0.014	-0.029	-0.616	0.539
Have you ever had a full denture for your upper jaw	-0.060	-0.796	0.427	0.019	0.327	0.744
Have you ever had a full denture for your lower jaw	-0.106	-1.141	0.159	-0.052	-0.925	0.356
Have you had a partial denture for your upper jaw	-0.031	-0.420	0.675	-0.036	-0.646	0.519
Have you had a partial denture for your lower jaw	0.169	2.278	0.024	0.134	2.312	0.022

* Adjusted in the regression for these variables: race, age, education, gender, marital status, transportation difficulty, imputed income, comorbidity score, depressive symptoms, and residence

† standardized regression coefficient