学校编码：10384　　分类号_____ 密级_____

学号：32620141150551　　UDC_____

厦门大学

硕 士 学 位 论 文

基于衰老生物标志物构建多维健康人体衰老指标体系及衰老度综合评价研究

Study on building multidimensional indicator systems of healthy human aging based on the biological marker

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论文提交日期：　2017 年 4 月

论文答辩日期：　2017 年 5 月

学位授予日期：　2017 年 6 月

答辩委员会主席：_____

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2017 年 5 月

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中 文 摘 要

研究目的

从流行病学与人体健康学角度出发，寻找和提出反映健康人群衰老程度的生理、心理、社会三维度的系列指标，构建人体衰老三维量表。阐明不同时序年龄健康人群外周血白细胞端粒长度的变化趋势，建立端粒长度与衰老量表分值的数量关系。了解不同年龄段健康人群的生活和生命质量，为预测和预防慢性病及老年性疾患研究提供支持和评估。

研究方法

通过将文献检索、收集的国际公认量表及科普量表汇总，经专家咨询、课题组商榷讨论形成量表的条目池；结合项目分析理论，依次采用频数分析法、离散程度法、相关系数法、因子分析法、克朗巴赫系数法、区分度法这几种统计方法完成对条目池的筛选和修改；经层次分析法（APH 法）进行衰老指标和维度权重的分配；采用内部一致性系数、分半系数、重测信度、因子分析法进行量表的信效度分析；采用实时荧光定量 PCR 法进行样本端粒长度的检测；采用相关系数法分析样本端粒长度与衰老分值及各维度分值的关系，做出综合评价。

研究结果

1、根据建立条目池的原则和方法，将条目归为生理、心理、社会三个维度，共提取 170 条条目，其中包含有生理维度 67 条，心理维度 69 条，社会维度 34 条，形成量表原始稿。经专家、课题组讨论后提炼的条目更加精简，剩下 97 条，其中，生理维度 41 条，心理维度 34 条，社会维度 22 条，比原来条目减少了 42.9%，符合量表条目少而精编制原则。

2、经频数分析法、离散程度法、相关系数法、因子分析法、克朗巴赫法、区分度法确定 62 个条目。其中，生理维度 25 个条目，含外貌形态（10 个条目）、感觉运动（7 个条目）、功能状态（8 个条目）；心理维度 21 个条目，含认知功能（7 个条目）、情绪方面（7 个条目）、性格方面（7 个条目）；社会维度 16 个条目，含社会关系（6 个条目）、社会适应（4 个条目）、社会支持（6 个条目）。

3、根据专家意见，比较各维度间的重要性，按层次分析法计算各维度的权重，生理维度 W_i=0.5936，心理维度 W_i=0.2493，社会维度 W_i=0.1571。

4、衰老量表 Cronbach's α 值为 0.898，分半系数值为 0.861，重测信度为 0.872；结构效度采用因子分析法，共提取三个公因子，累积方差贡献率达 46.44%。各维度与总分之间的相关系数在 0.8~0.9 范围之间。

5、现场实证发放 500 份问卷，有效问卷 457 份，有效率为 91.4%，男性 231 人（50.5%），女性 226 人（49.5%），性别比 1.02：1；年龄 18~88 岁之间，平均年龄 43.05±15.43 岁，男女性在年龄方面上差异无统计学意义(t=1.42，P=0.16＞0.05)；衰老量表总分值范围为 13.54~35.02，平均值为 23.28±4.50；生理维度分值范围为 13.65~39.01，平均值为 25.51±5.19；心理维度分值范围为 11.66~30.91，平均值为 20.80±4.34；社会维度分值范围为 9.64~26.85，平均值为 18.80±3.58；衰老总分值（r=0.863，P<0.01）、生理维度（r=0.812，P<0.01）、心理维度（r=0.876，P<0.01）、社会维度（r=0.766，P<0.01）与年龄均呈正相关关系；端粒平均长度为 1.13±0.30（T/S），与年龄呈负相关(r =－0.516，P＜0.01) ，即随着年龄的增长，端粒长度缩短；不同年龄组的平均端粒长度差异有统计学意义（F=84.62，P＜0.01）；衰老量表得分（r＝－0.54，P＜0.01）、生理维度（r＝－0.50，P＜0.01）、心理维度（r＝－0.57，P＜0.01）、社会维度（r＝－0.54，P＜0.01）与端粒长度呈负相关关系，表明了该份衰老量表具有较好的效标效度，是可以评价健康人体的衰老度的。

研究结论

经文献检索、公认量表及科普量表阅读的基础上，经专家、课题组讨论构建的衰老量表指标体系，具有较好的独立性、区分度高、代表性好等特点；量表的信度、效度理想；经大样本的实证研究证实端粒长度与年龄呈负相关关系，随年龄的增长，端粒长度缩短；量表的得分及各维度的得分与年龄呈正相关关系，随年龄的增大，分值增高，并与端粒长度呈负相关关系，表明了该量表具有较好的效标效度，可以用来评价健康人体的衰老度的。该量表符合世界卫生组织及各国政府在医疗卫生保健领域对衰老的认识，符合中国人群的衰老指标，具有良好的应用价值与光明前景。

关键词： 端粒长度；量表；衰老；老年医学

ABSTRACT

Objective

To proposed an index of physiological, psychological and social dimensions of the Aging Measurement of healthy people in the perspective of epidemiology and human health. To investigate the variation tendency of telomere length of peripheral blood leukocytes in healthy people of different sequential age, and to establish the quantitative relationship between telomere length and the Aging Measurement score. To shed light on the quality of life in different age groups and to provide support and basis for aging evaluation for predicting and preventing chronic diseases and senile diseases.

Method

Through literature searching, collection of internationally recognized summary scales and popular science scales, expert consultation and group discussion to form item pool; Combining item response theory, six statistic methods including frequency analysis, dispersion method, correlation coefficient, factor analysis, Cronbach's alpha, discriminate analysis were applied to screen and revise the item pool. Method according to analytic hierarchy process (APH) , aging index and multi-dimensions were given different weights by way of importance; Internal consistency coefficient, split half coefficient, test-retest reliability and factor analysis were used to evaluate the reliability and validity of the scale; We adopted real-time fluorescent quantitative PCR to detect the telomere length; Correlation coefficient method was applied to analyze the relationship between telomere length with the Aging Measurement score and every dimension score in order to make comprehensive appraisal on the aging.

Result

1. According to the principles and methods of establishing item pool, we collect a total of 170 items, dividing them into three dimensions about physical, psychological, social fields. The preliminary scale contains 67 items of physical dimension, 69 items

of psychological dimension, 34 items of social dimension. The remaining 97 items through experts and group members' discussion are more refined and simplified, 41 items of physical dimension, 34 items of psychological dimension, 22 items of social dimension among them. Reducing by 42.9% compared with the original items, which coincidence with the principle of smaller quantity, better quality.

2. Through methods of frequency distribution, dispersion, correlation coefficient, factor analysis, Cronbach's alpha and discriminate analysis, the scale contains 62 items in the finally. Among them physical dimension has 25 items, including appearance (10 items), sensorimotor (7 items), functional status (8 items); psychological dimension has 21 items, including cognitive function (7 items), emotional aspect (7 items), character aspect (7 items) and social dimension has 16 items, including social relations (6 items), social adaptation (4 items), social support (6 items).

3. We applied analytic hierarchy process to calculate the weight of each dimension according to the expert opinion with a result comparing the importance of each dimension that the weight of physiological dimension is 0.5936, psychological dimension is 0.2493 and social dimension is 0.1571.

4. The value of "Cronbach alpha" about Aging Measurement Scale was 0.898, the split-half coefficient was 0.861, the test-retest reliability coefficient was 0.872. Factor analysis was used to evaluate the construct validity of the constructed index system. A total of three common factors were extracted, and the cumulative variance contribution was 46.44%. The correlation coefficient between each dimension and total score were in the range of 0.8 to 0.9.

5. A total of 500 questionnaires were distributed in an empirical study on the scene and 457 of them were effective, with an efficiency of 91.4%. Therewere 231 males (50.5%) and 226 females (49.5%), the ratio of male to femalewas 1.02:1; The age ranged from 18 to 88 years. The mean age was (43.05 ± 15.43) years, and there was no significant difference between men and women in age (t=1.42, P=0.16 > 0.05). The range of total Aging Measurement score was 13.54 to 35.02 with an average of

23.28±4.50; the range of physiological score was 13.65 to 39.01 with an average of 25.51±5.19; the range of psychological score was 11.66 to 30.91 with an average of 20.80±4.34. the range of social score was 9.64 to 26.85 with an average of 18.80±3.58; The total score (r=0.863, P<0.01), physiological dimension(r=0.812, P<0.01), psychological dimension (r=0.876, P<0.01) and social dimension (r=0.766, P<0.01) were positively correlated with age. The average of telomere length was 1.13±0.30 (T/S),and it was negatively correlated with age(r = 0.516, P < 0.01), which can beconcluded that telomere length shortens with age gradually. Telomere length indifferent age groups was statistically significant different (F=84.62, P < 0.01).Total score (r = - 0.54, P < 0.01), physiological score (r = 0.50, P < 0.01), mental score (r = 0.57, P < 0.01), social score (r = 0.54, P < 0.01) were negatively correlated with telomere length which means that the scale has a good criterion validity to aging and it can be evaluated the aging degree health of human body.

Conclusion

The index systems of the Aging Measurement Scale which was establishedbased on literature collection, reading recognized scale and popular science scale, expert and group members' discussion were of good independence, well distinction and high representation. The reliability and validity of the scale was ideal. The empirical study confirmed that the relationship between telomere length and age was negatively correlated which meaned that telomere length was shortened with age. The total score and each dimension showed a positive correlation with age; which meaned the score increased with age. The score exhibited negatively correlation with telomere length, showing that the scale has goodvalidity which can be used to evaluate the aging degree of the health human. The Aging Measurement Scale was in line with the understanding of aging inthe field of medical and health care by WHO and other government, which was according with the aging index of Chinese population. It will have a goodapplication value and bright prospect.

Key Words: telomere length; scale; aging; geriatric medicine

中英文缩略词表

英文缩写	英文名称	中文名称
CA	Chronological Age	时序年龄
BA	Biological Age	生物学年龄
SOD	Super Oxide Dismutase	超氧化物歧化酶
WHOQOL	World Health Organization Quality of Life	世界卫生组织生存质量量表
AAQ	Aging Attitude Questionnaire	老化态度量表
SF-36	the MOS item short form health survey	健康状况调查简表
SCL－90	Symptom Checklist 90	九十项症状自评量表
MMSE	Mini-mental State Examination	简易精神状态量表
MFQ	Elderly Memory Function Questionnaire	老年记忆功能问卷
SAD	Social Avoidance and Distress Scale	社交苦恼与回避量表
SSRS	Social Support Revalued Scale	社会支持评定量表
SADS	Social Adaptive Diagnostic Scale	社会适应能力诊断量表
MUNSH	Memorial University of Newfoudl and Scale of Happiness	纽芬兰大学幸福度量表
CARE	the Comprehensive Assessment and Referral Evaluation	居家护理常用评估方法
OARS	Older Americans Resources and Services	老年人服务与资源评估问卷
CITC	Correct-Item Total Correlation	修正项目总相关
CR/CV	Critical Ratio/ Critical Value	临界比/决断值
CI	Coincident Index	一致性指标
CR	Coincident Ratio	一致性比率
APH	Analytic Hierarchy Process	层次分析法
DNA	Deoxyribonucleic acid	脱氧核糖核酸
PCR	Polymerase Chain Reaction	聚合酶链式反应
Ct	Cycle Threshold	循环阈值

目 录

Table of Contents

第一章 前言

1.1 研究背景

据报道，从 1985 年法国成为世界第一个老龄化的国家以来，人口老龄化已变成 21 世纪不可逆转的趋势，是全球所面临的一个公共卫生问题[1]。国内第六次人口普查数据结果显示，截止至 2010 年 11 月，我国总人口 13.4 亿，60 岁及以上人口为 1.78 亿，占 13.26%；其中，65 岁及以上人口为 1.19 亿，占 8.87%，已超过了联合国提出的 7%的标准，成为了老年型国家，预测到 2020 年第七次人口普查，我国 60 岁及以上老年人口比例将达到 17.17%，2050 年将超过 30%[2]，到时中国将成为世界老龄化形势最严峻的国家之一，衰老将成为影响国家经济长期发展的战略性问题。衰老是一种不可抗拒的自然退化规律，它具有不以人的意志转移为特点的生物学法则。正如有生必有死，每个人都会衰老，没有人能够幸免。现在一般认为衰老是一种随着时间推移必然发生的退行性的、不可逆的生理过程，它的英文名称为 ageing，可翻译为“加龄”、“增龄”，表现为随着年龄的增长，机体的器官、组织发生退行性改变，使机体的功能储备下降，对应激的适应性、抵抗力衰退[3]。衰老不是疾病，但是它可以增加患病的可能性。长期以来，人们把衰老的特征概括为五性：累积性（cumulative）、普遍性（universal）、渐进性（progressive）、内生性（intrinsic）、危害性（deleterious），这就是所谓的“衰老金标准”—丘比特（CUPID）标准[4]。我国著名的老年学刘汴生学者认为衰老还存在隐蔽性（conceal）和可逆性（reverse），他认为只有当个体意识到衰老的隐蔽性，才能及时地觉察并避免衰老的潜在危害性；而只有认识到衰老的可逆性，人们才能由被动变为主动，自发地采取有效的抗衰老措施，使早期的衰老得以逆转[5]。

衰老变化的过程称为老化度，对不同的人而言，开始出现老化的时间和速率的快慢也不尽相同[6]。一般而言，生理衰老是早于心理衰老的，随着生理衰老的进展，个体出现心理衰老，但是有时也会出现不一致。比如，有的人刚入花甲之年便老态龙钟，生活衰迈，不能自理；有的人年过八十仍健步如飞，精神抖擞，