

Personal characteristics that influence exercise behavior of older adults

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Abstract—Long-term exercise participation among older adults will result in healthier lifestyles and reduced need for health care. A better understanding, therefore, of what influences older individuals to start and maintain exercise plans would be beneficial. The twofold purpose of this study was (1) to create a knowledge base of determinants that influence exercise behavior in older adults and (2) to have health professionals prioritize determinants that affect exercise initiation and adherence in older adults. The expert panel examined nine determinants within the category of personal characteristics: age, gender, ethnicity, occupation, educational level, socioeconomic status, biomedical status, smoking status, and past exercise participation. The experts rated the determinants on importance for influencing exercise behavior of older adults. This expert panel concluded that older adults who are in good health and have a history of exercise activity might be more likely to participate in long-term exercise programs.

Key words: *aging, determinants, exercise.*

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INTRODUCTION

Many diseases and disabling conditions associated with aging can be prevented or delayed with regular exercise. In fact, two out of five adults aged 65 y or older report sedentary lifestyles, thereby increasing their death risk by 5 to 6 percent (1–3). Regular exercise is beneficial in preventing and managing hypertension, obesity, and diabetes mellitus in older females and males (4). These benefits can be attained with moderate exercise, such as a daily walk of 30 min and a 20-min strength training regimen 2 days a week. Continued exercise activity among older adults will result in healthier lifestyles and reduced need for medical care.

Despite advances in recruiting older adults into exercise interventions, recent studies have documented a 6 to 34 percent dropout rate, with the greatest number of dropouts occurring in the first 3 mo (5,6). To reduce dropout, particularly in older persons, one must understand the underlying factors producing it. In 1992, according to the Behavioral Risk Factor Surveillance System (BRFSS), only 23 percent of males and 15 percent of females over the age of 75 reported regular exercise at five times a week for 30 min or more per session (7). In order to create exercise programs to which older adults will

continually adhere, health professionals must have a greater understanding of what determinants or exercise factors influence long-term exercise participation in this age group (8).

The major reason for further study of exercise determinants or factors that affect exercise behavior in older adults is to expand our knowledge in developing physical activity interventions for public health planning. A comprehensive determinant review conducted by King et al. (9) identified five major areas that influence exercise behavior in the general population: personal characteristics; knowledge, attitudes and beliefs; psychological/behavioral attributes; activity characteristics; and environmental characteristics. However, it is not known if the same determinants that influence exercise behavior in young and middle-aged adults also pertain to older adults.

Dishman (10) has stated that identification of exercise determinants and their importance for getting and keeping older adults active is necessary. Boyette, Sharon, and Brandon (11) emphasize the need for such studies on selected subgroups because previous determinant research focused primarily on the general population. It is unclear if the determinants in King's review (9) pertain to older people or if there are unique or more specific determinants that may influence exercise patterns in this age group. A better understanding of all determinants and processes involved in initiation of and adherence to exercise programs by older adults is a matter of significant necessity to the geriatric health profession (11,12).

Research studies designed to examine exercise determinants would provide a valuable resource for professionals in the health-related fields (13). Therefore, the purpose of this study was twofold: (1) to create a complete knowledge base of determinants that influence exercise behavior in older adults and (2) to have experts in health professions prioritize the determinants that affect exercise initiation and adherence in older adults.

METHODS

Development of Determinants Knowledge Base

A descriptive research design was used in this study. We developed a detailed and comprehensive knowledge base of determinants that affect beginning (initiation) and maintaining (adherence) an exercise plan in older adults. In this study, the initiation phase was defined as the first

6 mo of starting a new exercise program while the adherence phase was the continuance of the exercise routine after the initial 6-mo period. A search of the literature revealed no published studies that generated a knowledge base specific for exercise determinants relating to older adults. We, therefore, used a modification of the determinant framework of King et al. (9) and applied the same five categories as the outline for doing a literature search of studies specific to exercise determinants relating to older adults.

The studies used in the knowledge base consisted of older adults over the age of 60 who were medically stable with normal physical, mental, and social capabilities. The studies were published from 1980 to 1997 and consisted of 100 articles relating to many of the determinants identified by King et al. (9) plus additional determinants (e.g., body image) recognized by other researchers (11). The theoretical framework of King et al. provided a solid basis for selecting studies relating to older adults, with the use of pre-established determinants known for the general population.

Also integrated within the knowledge base were results from exercise program research conducted at the Atlanta Veterans Affairs Rehabilitation Research and Development Center that used the Physical Exercise Profile (PEP) Questionnaire (13). The PEP assessment tool was used to identify which determinants were most important for exercise initiation and adherence in two exercise intervention studies with older adults. The PEP assessed seven major determinants: current exercise level, past exercise level, exercise motivation, perceived health status, physical fitness knowledge, body image, and socioeconomic status. In one PEP data set, there were 76 subjects aged 61 to 87 y (mean age = 73.51 y; SD = 6.44 y). The PEP was used with another data set consisting of 63 subjects aged 61 to 87 y (mean age = 72.06 y; SD = 5.217 y).

The final knowledge base used five major categories with distinct determinants in each of them: (1) personal characteristics (nine determinants); (2) knowledge, attitudes, and beliefs (nine determinants); (3) psychological/behavioral attributes (four determinants); (4) activity characteristics (four determinants); and (5) environmental characteristics (three determinants). This resulted in a total of 29 exercise determinants previously identified as incentives and/or obstacles to exercise initiation and adherence (9,10,13).

Validation of Determinants Knowledge Base

We then chose a panel of 18 experts (age range 41 to 70 y; mean age = 49.5 y) who consisted of 1 international expert, 13 national experts, and 4 local experts to participate in this project (names, titles, and affiliations provided in **Appendix A, Table**). All experts held postgraduate degrees and 50 percent were females. Experts were selected based on several criteria: (1) they had conducted research studies on exercise; (2) they had published extensively in geriatric research, and/or (3) they had clinical experience with the geriatric population.

The experts were professionals who frequently saw or interacted with older adults in their practices and provided them exercise counseling. Expert validation of the knowledge base was essential. Validation was done by reviewing the literature to determine if there was congruence between the knowledge base and their specific experiences with older adults, and then by prioritizing the importance of the determinants. Project staff individually mailed a copy of the knowledge base to each expert. Experts were asked to review it for organizational structure, completeness, and importance of the determinants. The experts provided knowledge in both the theoretical and applied aspects of exercise and aging throughout the project.

Because of the extensive amount of data collected for all five categories of determinants (a total of 29 determinants), we determined that to present these data effectively and comprehensively, each category should be presented separately. The “personal characteristics” category, with nine determinants, is the focus of this discussion. “Personal characteristics” represents those factors that create the unique demographic makeup of an individual that can sway his or her decisions about exercise behavior and are believed to be powerful determinants of exercise initiation and adherence. “Personal characteristics” includes age, gender, ethnicity, occupation, educational level, socioeconomic status, biomedical status, smoking status, and past exercise participation. We define biomedical status in this study as the rating of a patient’s health, provided by a physician.

Socioeconomic status (SES) is defined as the combination of educational level, occupation, and income level. This term is a more global term, but the published studies have also examined the components of SES. We therefore, took an extra step in having the experts not only review SES as a global term but also review educational level, occupation, and income level as separate components to assess their impact on exercise behavior.

Ratings and Analyses of Determinants Within “Personal Characteristics”

Experts independently rated each of the nine determinants in the “personal characteristics” category separately, for both initiation and adherence, according to its importance for exercise in older adults. The experts used a scale of 1 to 10, with 10 being most important (**Appendix B, Example**). Any determinant could get the same rating as any other determinant on this importance scale. Experts provided their rating information through the mail.

Data analyses included basic descriptive statistics on the experts’ ratings of the nine determinant variables. The determinant ratings were evaluated for means, standard deviations, and lower and upper 95 percent confidence intervals. If there was no visual overlap of confidence intervals when the nine determinants within the “personal characteristics” category were examined, the determinants were considered different (14).

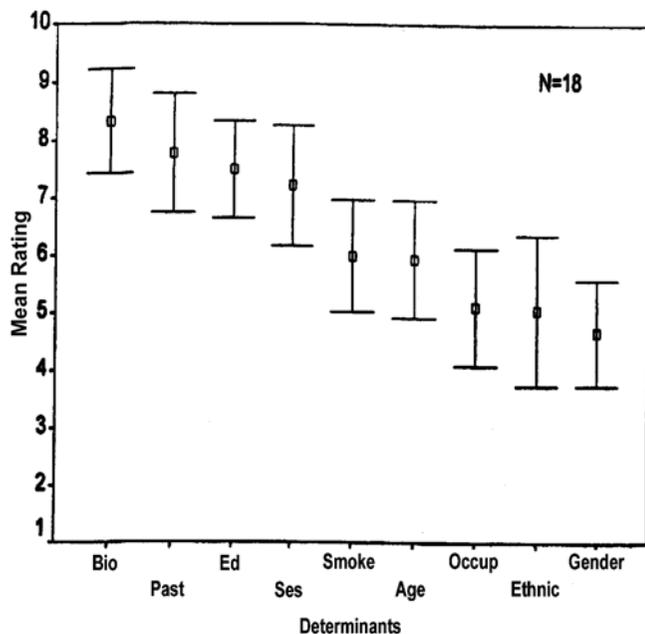
Means and confidence intervals were presented in graphic form for both the initiation and adherence phases (see **Figures 1 and 2**), enabling the reader to visually inspect for overlap of confidence intervals (14). Confidence intervals were reported in this article as the upper and lower limits around the mean.

The data should only be used descriptively and do not imply statistical significance, given the error rate involved with multiple pair-wise comparisons. We considered determinants with the higher means the more important factors, based on the opinions of the experts.

RESULTS

Determinants Knowledge Base

After receiving feedback on the knowledge base from the experts, the project staff made appropriate changes to reflect these suggestions or comments. Only minor editing was suggested and some categories were expanded to include more references, especially in the area of self-efficacy. The experts neither added more determinants than those already listed nor wanted to exclude any determinants. Their valuable input regarding expansion of some determinant information and their editorial comments were used to complete the final knowledge base. The experts reviewed and approved the final knowledge base with no further suggestions, edits, or changes.



Bio = biomedical status
 Past = past exercise level
 Ed = education
 SES = socioeconomic level
 Smoke = smoking status

Age = age
 Occup = occupation
 Ethnic = ethnicity
 Gender = gender

Figure 1. Initiation

Determinant ratings for exercise initiation phase. Nine “personal characteristics” determinants were rated for their importance in first 6 mo of exercise initiation. Means and lower and upper 95% confidence intervals (CI95%) were evaluated. CI95%’s are shown as difference between mean and its upper and lower bounds. In absence of visual overlap of confidence intervals, determinants were considered different from one another.

Ratings and Analyses of “Personal Characteristics” Determinants

All 18 experts completed the importance rating of the nine determinants within the category of “personal characteristics.” For the exercise initiation phase (**Figure 1**), determinants for biomedical status, past exercise participation, and educational level were rated notably higher than for occupation, ethnicity, and gender, as indicated by nonoverlap of confidence intervals. Specific data for each initiation phase determinant are shown in the **Appendix B, Table**, along with ranking order of determinants. The biomedical status mean was 8.3, with 95 percent confidence intervals (CI95%) of 7.4 to 9.2. Past exercise participation received the second highest rating, (mean = 7.8, CI95% = 6.8 to 8.8), while educational level was rated as the third highest initiation determinant

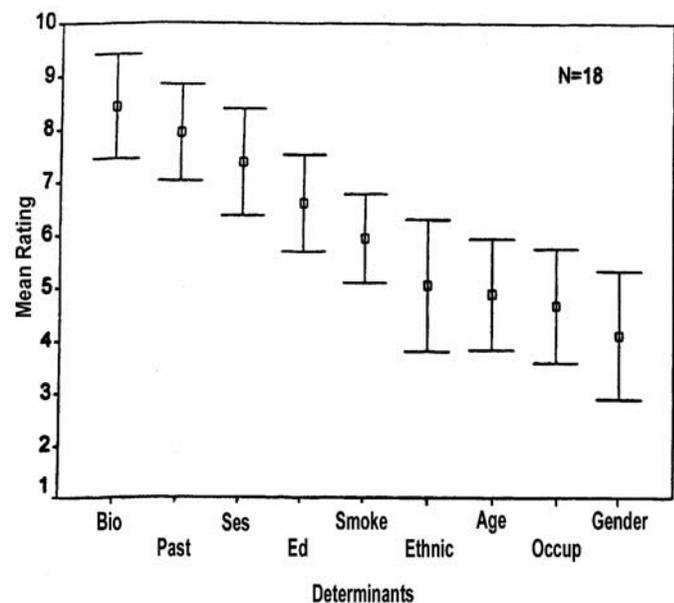


Figure 2. Adherence

Determinant ratings for exercise adherence phase. Nine “personal characteristics” determinants were rated for their importance after first 6 mo of exercise initiation. Means and lower and upper 95% confidence intervals (CI95%) were evaluated. CI95%’s are shown as difference between mean and its upper and lower bounds. In absence of visual overlap of confidence intervals, determinants were consid-

(mean = 7.5, CI95% = 6.7 to 8.3). SES was rated as the fourth highest determinant (mean = 7.2, CI95% = 6.2 to 8.2) and was rated higher than occupation and gender. The other determinants received mean scores from 6.0 to 4.7, with gender receiving the lowest rating.

For the exercise adherence phase, biomedical status and past exercise participation were rated higher than smoking status, ethnicity, age, occupation, and gender (**Figure 2**), as indicated by nonoverlap of confidence intervals. SES was rated higher than ethnicity, age, occupation, and gender. Specific data for each adherence phase determinant are shown in the **Appendix B, Table**, as is the determinant ranking order. The adherence data indicated that biomedical status continued to be the most important determinant, having the highest mean rating of 8.4, CI95% = 7.4 to 9.4 (**Appendix B, Table**). Past exercise participation received the second highest rating with a mean of 7.9, CI95% = 7.0 to 8.8. The SES determinant was rated as third highest, receiving a mean value of 7.4, CI95% = 6.4 to 8.4. The other adherence factors received mean ratings of 6.6 or less, with gender again rated as least important for this age group.

DISCUSSION

This study provided support for prioritizing which determinants within the “personal characteristics” category are most important when designing an exercise plan for older adults. During the initiation and adherence phases of exercise, our experts rated biomedical status as the most important determinant. They strongly agreed that the state of health of older adults has an impact on how likely they are to initiate and adhere to exercise, which is consistent with other findings in the literature (15,16). It has been consistently reported that healthy adults are more active than persons with medical complications (15,17). A thorough evaluation of the illnesses, injuries, health conditions, and symptoms of an older person should be documented.

Monitoring the biomedical status of an older adult is important when working with this age group because status can quickly change. If the older adult continues to have few illnesses and injuries, she or he is more likely to stay in the exercise program.

In a sample of over 6,000 older adults, aged = 70 y, Wolinsky, Stump, and Clark found that persons with orthopedic limitations are less likely to exercise (15). According to the study, heavier body mass also negatively affects psychosocial behaviors such as motivation and body image. Other studies also report that overweight individuals are less likely to participate in exercise than normal weight individuals (9,16). According to Dishman, overweight individuals are less likely to stay with a vigorous exercise plan and might respond better to moderate activities, such as walking (18). In a group of women of ages 55 to 96 y, biomedical conditions that affect exercise participation were examined (19). The only significant chronic biomedical condition that differed between the exercisers and nonexercisers was a previous diagnosis of osteoporosis.

Past exercise participation was rated as the second highest determinant for exercise initiation and adherence. Other studies have found similar results when examining past exercise participation. In the study by Boyette, Sharon, and Brandon, past exercise level was a significant determinant of exercise adherence in a sample of 76 older adults (11). Older adults who survived the 50 percent attrition rate during the first 6 mo of exercise were likely to continue to exercise 1 y later (20). According to McAuley, Lox, and Duncan, once a regular routine of

exercise was established, this habitual activity became a major predictor of future exercise maintenance (21).

Learning the history of past exercise participation of the older adult, including past leisure activity, structured exercise activity, and advanced activities of daily living, will help identify strategies to optimize future exercise behavior. Exercise history over the past year, and especially within the past month, should be assessed. It is advisable to determine what previous exercise activities the client liked or disliked, as well as to examine his or her previous exercise incentives and barriers.

The experts rated educational level as the third most important determinant during the initiation phase. The positive association between exercise participation and level of education has been established in a number of other studies (17,22–23). Clark conducted a study that examined educational differences in physical activity levels of adults 70 and older while controlling age, sex, race, and income (24). The participants were asked if they “get as much exercise as needed” and if they “have a regular exercise routine.” Those individuals with 8 y or less of education were found to be less physically active than those with 9 y or more of education. In another study conducted by Booth et al., more exercise generally decreased with increasing age, but increased with the education level when age was controlled (25).

An educational component should be part of the exercise plan, with explanations provided for how exercise may impact health conditions and symptoms. The health practitioner should also explain major concepts of exercise to the older participant, such as target heart rate, perceived exertion, and body composition. It would be worthwhile to use written handouts with exercises and pictures that are appropriate for the educational level of the individual. The health practitioner could heighten exercise awareness using methods tailored to the preferred learning mode(s) of the individual (i.e., group discussions, fun and educational games, interview, and demonstration and practice with the machines and equipment).

SES was rated by our experts as being the third most important determinant during the adherence phase, instead of education. In this study, SES was defined as the combination of an individual’s income, education, and occupation. Few studies have examined the relationship between different levels of SES and exercise. Ford et al. reported that women of lower SES spent significantly less time in physical activity than women of higher SES (26). In contrast, the amount of time spent per week in physical activity reported by men of upper and lower

SES was nearly the same. Both Ford et al. and Schoenborn have also found that men and women with higher SES spent more time engaged in leisure-time physical activity than did lower SES men and women (26,27). King maintains that the success of some community exercise intervention programs are of substantial interest to lower socioeconomic groups and need not be limited to the middle and upper class (28). For example, the Community Health Assessment and Promotion Project (CHAPP) targeted inner-city residents of Atlanta and found that this community segment was quite interested in exercise (29). Therefore, to promote exercise within this group, security escorts were furnished for groups walking in dangerous neighborhoods, curtains were added to the exercise classrooms to increase privacy, and methods for arranging transportation were provided.

SES is also important during the adherence phase, because the income level of an older adult might be changing as he or she enters or remains in a retirement life phase. Therefore, when the health professional is updating the exercise plan during the adherence phase, he or she needs to know how much money, if any, the client is willing to pay for exercise. Perhaps, after 6 mo of initiating an exercise plan, even though an individual knows that she or he needs to continue exercising, there are now questions about the expense and priority of the program, in light of other commitments. For example, if the older adult can continually afford the exercise plan and sets aside time to exercise after a working day, there will be a positive correlation for continued exercise maintenance.

Based on this sampling of expert opinions, age, gender, ethnicity, occupation, and smoking status were not rated as important as other factors for habitual exercise in older adults. However, these demographic factors are necessary pieces of information for obtaining an accurate profile of the older individual. Obviously, the age of the client is important to consider because older individuals

may have a greater appreciation of exercise activities that provide health-related fitness benefits as opposed to performance-related benefits. Older individuals with different ethnic backgrounds have different life experiences and, therefore, might feel more comfortable with certain exercise activities than with others. The work status of the older person is relevant because he or she may still work part-time or have a volunteer position, making their work location and/or time commitments pertinent information. If the older adult smokes, the health practitioner may prescribe a lower intensity level during the initial stages of exercise. While smoking is a difficult habit to change, the older adult might be able to overcome it with the help from the health professional.

CONCLUSIONS

This study prioritized determinants within the “personal characteristics” category that are most important when designing an exercise plan for older adults. Expert health professionals identified biomedical status, past exercise participation, and education, in order of decreasing priority, as most important during the initiation phase. During the adherence phase, the most important determinants were prioritized as biomedical status, then past exercise participation, and finally, SES. These findings suggest that healthier older adults who have a history of exercise are more likely to start and maintain an exercise plan. Additionally, educating older adults on the benefits of exercise increases the likelihood of them initiating and adhering to an exercise prescription. Older adults, in conjunction with their healthcare professional, should identify strategies that can remove barriers to exercise and create incentives to optimize the habit of regular exercise in their lifestyle.

APPENDIX A

Panel of Experts

Table.

The following table is the panel of 18 experts (age range 41 to 70 y; mean age = 49.5 y) who consisted of 1 international expert, 13 national experts, and 4 local experts to participate in this project. The experts were professionals who frequently saw or interacted with older adults in their practices and provided them with exercise counseling. They provided expert validation of the determinants knowledge base that was essential. These experts provided knowledge in both the theoretical and applied aspects of exercise and aging throughout the project.

Type of Expertise	Name, Professional Degree(s)	Affiliation
International experts (n = 1)	Sarah Elizabeth Lamb, MSc, MCSP, SRP	Harkness Fellow in Public Policy, The Commonwealth Fund of New York.
National experts (n = 13)	1. Judy Beamer, BS	Director, Cecile Cox Quillen Exercise Research Program, East Tennessee State University.
	2. Steven N. Blair, PED	Director, Epidemiology and Clinical Applications; Cooper Institute for Aerobics Research in Dallas, TX.
	3. Carl J. Caspersen, PhD, MPH	Physical Activity Epidemiologist, Physical Activity and Health Branch, Division of Nutrition and Physical Activity, National Center for Chronic Disease, Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA.
	4. Robert P. Cunningham, MD	Corporate Medical Director, retired; Bell South, Atlanta, GA.
	5. Barbara de Lateur, MD	Professor, Director and Lawrence Cardinal Shehan Chair, Department of Physical Medicine and Rehabilitation, The Johns Hopkins Hospital, School of Medicine. Joint Professor of Health Policy and Management, School of Hygiene and Public Health, Baltimore, MD.
	6. Barbara J. Fletcher, RN, MN, FAAN	Clinical Associate Professor, University of North Florida, College of Health, Department of Nursing.
	7. Ronald C. Hamdy, MD, FACP, FRCP	Associate Chief of Staff, Extended Care & Geriatrics, Veterans Affairs Medical Center, Mountain Home, Tennessee. Holder of the Cecile Cox Quillen Chair of Excellence in Geriatric Medicine & Gerontology at James H. Quillen College of Medicine, East Tennessee State University, Johnson City, Tennessee. Director of the East Tennessee State University Osteoporosis Center.
	8. Priscilla G. MacRae, PhD	Professor of Sports Medicine, Department of Sports Medicine and Physical Education, Pepperdine University, CA.
	9. Edward McAuley, PhD	Professor of Exercise Psychology, Department of Kinesiology, University of Illinois at Urbana-Champaign.
	10. Miriam C. Morey, PhD	Director, GEROFIT, Geriatric Research, Education and Clinical Center, VA Medical Center, Assistant Research Professor, Department of Medicine, Center on Aging and Human Development, Duke Medical Center, Durham, NC
	11. Scott Sherman, MD, MPH	Assistant Professor Medicine, UCLA/San Fernando Valley Program. Chief, PACE Research, Evaluation, and Faculty Development, Sepulveda VA Medical Center.
	12. Frank Whittington, PhD	Professor of Sociology and Director of the Gerontology Center at Georgia State University, Atlanta, GA.
	13. Jeffrey C. Rupp, PhD	Associate Professor and Chairman, Department of Kinesiology & Health, Georgia State University, Atlanta, GA.
Local experts (n = 4)	1. Carol E. Coogler, ScD	Assistant Professor, Emory University School of Medicine & Center for Rehabilitation Medicine, Emory University, Atlanta, GA.
	2. Sandra B. Dunbar, RN, DSN	Professor, Nell Hodgson Woodruff School of Nursing, Emory University, Atlanta, GA.
	3. Dale Strasser, MD	Chief of Rehabilitation Medicine, Wesley Woods Geriatric Hospital, & Interim Chair, Department of Rehabilitation Medicine, Emory School of Medicine, Atlanta, GA.
	4. Robert A. Zorowitz, MD, FACP	Medical Director of Geriatrics Services, DeKalb Regional Healthcare System, Decatur, GA.

APPENDIX B

Sample Initiation Importance Rating Sheet

Please rate each of the determinants independently, on a scale of 1 to 10, based on how important you think each determinant is in getting healthy, older adults (aged 65 to 85 y) to initiate exercise programs. Importance of determinants will vary between individuals; however, for the purpose of this rating, consider the determinants in a general sense for all healthy older adults.

A rating of 1 means that you think the determinant is not important at all for initiation, while a rating of 10

means that you think the determinant is most important for initiation. Independently rating each determinant means that you assign a score of 1 to 10 to each determinant, so determinants that you think are of equal importance to exercise initiation are given the same score. If you added some determinants to the knowledge base, please use the blank spaces in the right column to fill in the additional determinants and their associated ratings.

Personal Characteristics

- ___ Age
- ___ Gender
- ___ Ethnicity
- ___ Occupation
- ___ Education
- ___ Socioeconomic status
- ___ Biomedical status
- ___ Smoking status
- ___ Past exercise participation

The initiation phase is the first 6 mo of starting a new exercise program, and the adherence phase is the continuance of the exercise routine after the initial 6-mo period.

The determinant ratings were evaluated for lower and upper 95 percent confidence level intervals. Confidence intervals were reported as the upper and lower limits

around the mean. If there was no visual overlap of confidence intervals when the nine determinants within the "personal characteristics" category were examined, then the determinants were considered to be rated differently from each other.

Table.

Ratings of determinants by experts.

Determinant	Initiation Phase			Adherence Phase		
	Mean \pm 1 SD	Range	Rank	Mean \pm 1 SD	Range	Rank
Age	5.9 \pm 2.1	2 – 10	6	4.9 \pm 2.1	2 – 10	7
Biomedical status	8.3 \pm 1.8	4 – 10	1	8.4 \pm 2.0	4 – 10	1
Educational level	7.5 \pm 1.7	3 – 10	3	6.6 \pm 1.9	3 – 10	4
Ethnicity	5.1 \pm 2.6	1 – 10	8	5.1 \pm 2.5	2 – 10	6
Gender	4.7 \pm 1.8	2 – 8	9	4.1 \pm 2.4	1 – 9	9
Occupation	5.1 \pm 2.1	2 – 8	7	4.7 \pm 2.2	2 – 8	8
Past exercise	7.8 \pm 2.1	4 – 10	2	7.9 \pm 1.8	4 – 10	2
Smoking status	6.0 \pm 2.0	2 – 9	5	5.9 \pm 1.7	2 – 8	5
Socioeconomic status	7.2 \pm 2.1	3 – 10	4	7.4 \pm 2.0	3 – 10	3

SD = one standard deviation

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