



Behavioral Determinants of Health Aging Revisited: An Update on the Good News for the Baby Boomer Generation

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Abstract

On October 15th, 2007, Kathleen Casey-Kirschling became the first Baby Boomer to ride the "silver tsunami" by applying for her social security benefits. Riding a wave is an appropriate analogy for Baby Boomers given the expectations they have for their later years. Now, just as it was in the original 2003 Behavioral Determinants article, the answer to the question, "Can this generation of Americans expect to achieve a satisfying, high- quality life as older adults?" is still a resounding yes. But now, there is greater clarity and more specific detail as to exactly what the Baby Boomer generation should, and can, be doing to insure that they have the quality of life as older adults that they have become accustomed to in their younger years. To that end, this article will examine the updated recommendations for physical activity and psychological elements associated with healthy aging.

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On October 15th, 2007, Kathleen Casey-Kirschling became the first of the Baby Boomer generation to ride the "silver tsunami" (a term coined by Mary Finn Maples in 2002 to represent the rising swell of Baby Boomers moving towards older adulthood) by applying for her social security benefits. Having been born at one second past midnight on January 1, 1946, Ms. Casey-Kirschling has the unique distinction of being regarded as Baby Boomer #1. The "wave" is not only a figurative symbol for the Baby Boomers. The wave is also this group's literal expectation for continuing an active and fulfilling lifestyle into their later years. In other words, Baby Boomers want to hike, bike, and surf their way into retirement.

[Baby Boomers want to hike, bike, and surf their way into retirement.](#)

In the original Behavioral Determinants article ([Hartman-Stein & Potkanowicz, 2003](#)), we spoke of the leading edge of the Baby Boomer generation moving steadily towards their older adult years. Those born between 1946 and 1964 will start to reach the age of 65 by 2011; and estimates now suggest that by 2030 the number of adults 65 years of age and over will be 71 million, or, 20% of the United States (U.S.) population ([Centers for Disease Control and Prevention \[CDC\], 2007](#)). The wave is a big one.

Like the steady march of this Baby Boomer generation, the recommendations for healthy aging have continued to move forward and change as well. As such, an update to the original ([2003](#)) article is warranted. The foundation for this update is the recent position stand released jointly by the American College of Sports Medicine and the American Heart Association (AHA) ([Nelson et al., 2007](#)). This position stand incorporates the recommendations of numerous health and fitness organizations, findings from the research community, and literature reviews. This position stand suggests that now, just as it was in 2003, the answer to the question, "Can this generation of Americans expect to achieve a satisfying, high-quality life as older adults?" is still a resounding yes. But now, there is greater clarity and more specific detail as to exactly what the Baby Boomer generation should be doing to insure that they have the quality of life as older adults that they have become

accustomed to in their younger years. To that end, this article will examine both the updated recommendations for physical activity and psychological elements associated with healthy aging.

The Key to Remaining Physically Fit

Physical fitness includes both health-related fitness and skill-related fitness. In this section the authors will define physical fitness, discuss the role of physical activity in fitness, offer guidance for pre-exercise screening, and review the updated recommendations for aerobic activity, muscle strengthening, and flexibility and balance. They will conclude by considering how much physical activity is enough.

What Physical Fitness Really Is

For the sake of clarity, physical fitness is defined by the American College of Sports Medicine (ACSM) as:

...a set of attributes or characteristics that people have or achieve that relates to the ability to perform physical activity. These characteristics are usually separated into either health-related or skill-related components ([2009, p. 2](#)).

Although many people aspire to possess the skill-related components associated with physical fitness, e.g., agility, balance, coordination, speed, power, and reaction time, we benefit more on a day-to-day basis, and certainly in the long term, from the health-related components of physical fitness. That is not to say that skill-related attributes cannot be attained or achieved by the older adult; but rather that the general population of older adults benefits more significantly from possessing the health-related attributes. As defined by the ACSM ([2006, p. 3](#)), health-related physical fitness:

...is associated with the ability to perform daily activities with vigor, and the possession of traits and capacities that are associated with a low risk of premature development of hypokinetic diseases (e.g. those associated with physical inactivity, like obesity, diabetes, and hypertension).

The combination of high levels of both health-related fitness, and its associated traits and capacities, such as cardiovascular endurance, muscular fitness, flexibility, body composition, and physiologic fitness (fitness that relates to the status of metabolic systems, body compositional factors, and bone mineral density) can increase a Baby Boomer's chances of enjoying a life filled with satisfying personal experiences, a life of good quality, and a life of pursuits not hindered by physiological setbacks...

The Role of Physical Activity in Fitness

Fitness and healthcare professionals have made great strides in improving the public's recognition of the importance of regular physical activity. Through the work of organizations, such as the American College of Sports Medicine (ACSM), The American Heart Association (AHA), and The National Institutes of Health (NIH), as well as through initiatives like Healthy People 2010, the public's recognition of the importance of regular physical activity has improved appreciably. However, there are those who suggest that the biggest challenge that the fitness and healthcare professions face is clearing up the confusion that the public has with regard to exactly what they should be doing in terms of physical activity. In other words, the public is unsure as to what types of actual activities are needed, how often these activities should be performed, and with what intensity they should be performed ([Howley, Bassett, & Thompson, 2005; U.S. Department of Agriculture & the U.S. Department of Health and Human Services, 2005](#)).

Baby Boomers today stand a very good chance of dramatically reducing their risk for developing a chronic disease as long as they include regular physical activities in their daily lives and receive appropriate direction regarding these activities.

What makes the topic of exercise recommendations particularly problematic and troublesome is that this lack of specific information can potentially lead to inactivity and/or indifference. According to the CDC ([2007](#)), physical inactivity is one of the three behaviors (along with smoking and poor diet) that contributed to almost 35% of all deaths in the US in the year 2000, as these behaviors often contributed to the development of diseases. Sadly, the older adult population is the least active of all age groups ([CDC, 2003](#)). In 2002, 32% of adults age 65 and older died from heart disease, 22% died from cancer, and 8% died from a stroke. In total, these three conditions represented 61% of all deaths among this age group ([CDC, 2007](#)). Perhaps the most disturbing recognition is that the eventual deaths associated with these conditions were largely preventable. Baby Boomers today stand a very good chance of dramatically reducing their risk for developing a chronic disease as long as they include regular physical activities in their daily lives and receive appropriate direction regarding these activities.

Pre-Exercise Screening

In the original 2003 article, the recommendations offered for physical activity were prefaced by the recommendations that (a) before beginning any exercise program, the individual should consult with a physician to insure that he or she is healthy enough to begin an exercise program, and (b) the individual should seek the advice and guidance of an exercise professional certified through a recognized certifying body, such as the ACSM or National Strength and Conditioning Association. Both of these recommendations still stand and are strongly encouraged.

However, the screening process is changing today. While not a substitute for direct contact with an exercise or medical professional, older adults can now begin the screening process and initiate a self-directed physical activity program through the use of a new screening tool called the EASY tool, which is an acronym for Exercise Assessment and Screening for You. The EASY tool, according to the authors ([Resnick et al., 2008, p. 215](#)):

...is a tool developed to help older individuals, their health care providers, and exercise professionals identify different types of exercise and physical activity regimens that can be tailored to meet the existing health conditions, illnesses, or disabilities of older adults.

The authors go on to say that the EASY tool can be completed either independently by the older adult or with the assistance of a healthcare or exercise professional. The authors contend that pre-exercise screening should not keep people from being physically active (and many screening tools do so), but rather should set people on their way to being physically active, given that physical activity in all age groups is good. The EASY tool is available online at the EASY website <www.easyforyou.info>.

Updated Recommendations for Aerobic Activity

When one considers the number of activities in any given day that require aerobic activity, commonly called endurance, and the important role of endurance in independent living, the importance of sufficient aerobic capacity becomes apparent. Older adults need sufficient aerobic capacity to get through their day and to retain their independent lifestyle. Spirdusso, Francis, and MacRae (2005) noted that estimates of minimal levels of aerobic capacity for independent living are approximately 13 milliliters of oxygen per kilogram of mass for each minute of activity (or 3.7 METS, where $1 \text{ MET} = 3.5 \text{ ml X kg}^{-1} \text{ X min}^{-1}$).

Research has demonstrated that aerobic capacity changes as one ages. Estimates place the age-related decline in aerobic capacity at approximately 1% per year, for each year after the age of 25 ([Spirdusso et al. 2005](#)). Furthermore, the rate of decline is thought to increase between the ages of 65 and 75 and then again between the ages of 75 and 85. Sufficient aerobic capacity not only helps to maintain an independent lifestyle, it also contributes to the prevention of multiple chronic disease processes. Being physically active is an important tool in promoting healthy aging.

Before examining the updated recommendations for aerobic activity, it is important to operationally define some aerobic-related terms. With respect to aerobic activity, and relative to one's fitness level, moderate-intensity aerobic activity is defined as a rating of 5-6 on a 10-point scale, where 0 is sitting, 10 is an all out effort, and 5-6 involves a noticeable increases in heart rate and breathing ([Nelson et al., 2007](#)). Similarly, and using the same 10-point scale, vigorous-intensity aerobic activity is defined as a rating of 7 or 8, at which point large increases in heart rate and breathing are noted (Nelson et al.).

The new recommendations from the ACSM and the AHA ([Nelson et al., 2007](#)) suggest that in order to maintain and promote health, the older adult needs to participate in moderate-intensity aerobic activity for a minimum of 30 minutes on five (5) days each week. Or, if capable, the older adult can engage in vigorous-intensity aerobic activity for 20 minutes on three (3) days each week. It should be noted that the recommendations also indicate that a combination of both moderate- and vigorous-intensity aerobic activity can be performed to meet these aerobic activity recommendations. An important point to remember is that these recommendations for aerobic activity are in addition to the normal, light-intensity activities of daily living (ADLs) which include self care or cooking, or moderate-intensity activities (e.g. walking around the office or walking from the parking lot) lasting less than 10 minutes respectively. For a comparison of the full 2003 and 2008 recommendations please refer to [Table 1](#).

Updated Recommendations for Muscle Strengthening

Within the context of activities of daily living, there are a number of activities that require moderate levels of strength and power (e.g., carrying groceries, lifting grandchildren, and getting into and out of a car) ([Spirdusso, Francis, & MacRae, 2005](#)). More complex activities, too, require more than minimal levels of muscular strength. A muscular strength training regimen is necessary to have the lifestyle outcomes desired by the Baby Boomers. The importance of muscular strength training cannot be understated.

A muscular strength training regimen is necessary to have the lifestyle outcomes desired by the Baby Boomers.

Before examining the recommendations for muscular strength, it is again appropriate to operationally define some terms with respect to level of effort. With respect to muscle-strengthening activities, a moderate-intensity effort is defined as a rating of 5-6 on a 10-point scale, where 0 is no movement and 10 is a maximal effort for the muscle group (Nelson et al., 2007). Using the same 10-point scale, a high-intensity effort is defined as a rating of 7 or 8.

According to the new recommendations (Nelson et al., 2007), older adults should strive to engage in activities that maintain or increase muscular strength on a minimum of two days each week. To that end, older adults should choose 8-10 exercises that use major muscle groups and perform them on two or more non-consecutive days each week. Each exercise, and its associated resistance (weight) should allow for 10-15 repetitions, with the level of effort being moderate to high (relative to one's ability).

Updated Recommendations for Flexibility and Balance

The recommendations for flexibility have remained relatively unchanged, except for recommendations regarding frequency and duration. Older adults are still encouraged to participate in some form of flexibility training; however, they are now encouraged to do so on at least two days of each week for at least 10 minutes each time. As we stated in the original article (Hartman-Stein & Potkanowicz, 2003), "When we take the time to consider just how important freedom of movement and flexibility are in everyday living, it becomes easier to see the significant role that flexibility training can play in maintaining one's quality of life."

An element not directly addressed in the 2003 article is the current recommendation that older adults should intentionally pursue and participate in exercises and training that improve balance and reduce the risk of falls. In the past, balance training was considered a passive component of some other training mechanism or regimen. The current recommendations suggest that as a way to prevent falls in those individuals with a known risk for falls; for example, older adults with mobility problems or those who fall frequently, the older adult should perform exercises that will contribute to the maintenance and improvement of balance (Nelson et al., 2007). To add to that, the older adult should pursue these activities even if he or she does not present with known risks, given that prevention is the key to reducing the risk of falls.

Some is Good, More is Better

The preceding recommendations represent the minimum levels of involvement with respect to aerobic activity and muscle strengthening. Being minimum recommendations, the older adult can expect to experience the minimum in the way of outcomes. While this amount of improvement is not necessarily a bad thing, Nelson et al. (2007) point out that if older adults wish to: (a) improve their personal fitness, (b) improve their management of an existing condition or disease where higher levels of physical activity may have greater therapeutic value, and/or (c) reduce their risk of premature health conditions or mortality from chronic conditions related to physical inactivity, they should strive to engage in activities that exceed the minimum levels. This recommendation assumes that the older adult does not have a condition that would preclude higher levels of physical activity. Further, the older adult should also pursue additional muscle-strengthening, higher-impact, and weight-bearing activities in an effort to further maintain and enhance skeletal health. Examples of these muscle-strengthening and weight-bearing activities include increasing the number of muscles or muscle groups trained, working at progressively higher intensities, and jogging rather than walking.

Perhaps most encouraging for the older adult are studies showing that the older adult possesses a capacity for change, both aerobically and muscularly, that is similar to the young adult (Frontera, Meredith, O'Reilly & Evans, 1988; Kohrt et al., 1991; Meredith et al., 1989). While the exact mechanism of change in the older adult has yet to be fully elucidated, the message is quite clear: physical activity contributes to successful and healthy aging. Although it cannot be definitively stated that physical activity extends life, it can be said that physical activity improves life, given its influence on the incidence and onset of chronic disease.

The Key to a Sharp Mind

...maintaining cognitive ability and slowing age-related cognitive decline have become hot topics for researchers and general public.

In the original 2003 article, we noted, "cognitive decline, especially memory deficit associated with aging, is a concern of many Baby Boomers in regard to their parents as well as themselves." We also reviewed the topics of maintaining cognitive abilities, emotional health, and the relationship between religion and physical and mental health. While the latter two areas remain important elements of healthy aging, maintaining cognitive ability and slowing age-related cognitive decline have become hot topics for researchers and the general public. Many new resources related to cognitive abilities are available for the general public. In the last few years, however, the media has been abuzz with hopeful news that we may be able to keep our brain fit just as we keep our body fit, and thereby age successfully. In this section we will examine recent findings addressing the preservation of the older adult's cognitive capacity as we discuss theoretical perspectives related to cognitive functioning, such as cognitive reserve and neurogenesis; interventions to enhance cognitive functioning, for example, enriched environments and cognitive activities; the relationships between and among physical activities, cognition, and social functioning; and commercial brain fitness products.

Cognitive Reserve

Until relatively recently, the dominant view of cognitive aging has been that of pervasive, progressive, and irreversible decline. However,

current theoretical underpinnings of enhancing cognitive fitness later in life, i.e., at age 65 and older, are based on the concepts of cognitive reserve and neural plasticity. Both constructs are exciting and hopeful because they imply that the older adult can actively help to preserve his/her intellectual capacity. Cognitive reserve theory explains why some individuals are more resilient or adaptive to brain pathology and can function well in everyday life despite neuronal damage. It implies that people have more cognitive capacity than needed for survival, and that we can draw from an extra "reserve" when needed ([Stern, 2006](#); [Vance & Crowe, 2006](#)).

According to cognitive reserve theory, a higher reserve arises from a combination of greater overall cognitive efficiency, greater proliferations of brain neurons, more connections between neurons, and an enhanced ability to compensate by recruiting generalized neurons for specific tasks at hand and using alternative strategies to solve problems ([Grady, 2006](#)). The investigations into the hypotheses of cognitive reserve suggest that childhood cognition, educational and IQ levels, professional attainment, occupational complexity, and lifestyle characteristics, such as level of activity and nutrition, all lead to greater cognitive reserve ([Richards & Sacker, 2003](#); [Scarmeas & Stern, 2003](#)). Although older, retired adults are not able to build cognitive reserve via childhood educational and occupational attainment, they can make changes in their current lifestyle through engagement in educational and other cognitive-enhancing activities. Vance and Crowe ([2006](#)) suggest that the steps to prevent loss or to increase cognitive reserve include engaging in cognitively stimulating activities and using cognitive training techniques. The reserve model is a dynamic process that applies across the life course, suggesting that cognitive ability is modifiable at all life stages ([Richards, Sacker, & Deary, 2006](#)). These notions clearly have significant positive implications for the aging Baby Boomer.

Neurogenesis

Similarly encouraging is the theory of neurogenesis. For most of the twentieth century, scientists believed that brain cells, unlike hair cells, skin cells and other cells in the body, could not reproduce; i.e., a human would have no more neurons at death than he or she had at birth – and would probably have significantly fewer. Then, near the end of the last century, researchers discovered that two brain structures, the hippocampus (a structure involved in memory and learning) and the olfactory bulb (the brain structure involved in the perception of odor) could generate new cells. Even adults beyond the age of 65 had the capacity for neurogenesis in these two structures ([Gould, Beylin, Tanapat, Reeves, & Shors, 1999](#)). This phenomenon, originally discovered in bird models, has also been found in other animal models, most often rats or mice, and sometimes dogs. Such research must use animal models because it entails sacrificing animals to examine their brain for signs of new cells. However, among neuroscientists, there is no doubt that what has been observed in other mammals is also true of humans, and that this potential exists throughout the lifespan ([Bruel-Jungerman, Rampon, & Laroche, 2007](#)).

Along the lines of neurogenesis, there is evidence to suggest that there can also be growth in the connections between neurons. Vigorous physical activity appears to enhance neuronal growth, while learning, which involves using the cells, appears to promote new connections ([Olson, Eadie, Ernst, & Christie, 2006](#)). Taken together, the factors that can produce structural and functional changes in the brain are referred to collectively as an "enriched environment." Although all of the research to date has used animal models, usually rats or mice, the potential is encouraging for humans.

Improving Cognitive Capacity through Enriched Environments

In 2006 the community of scientists on the cutting edge of research regarding the role of physical and cognitive exercise in promoting cognitive vitality made the following recommendation: The concept of the "enriched environment" currently employed in animal studies to promote physical activity, socialization, and problem solving, needs to be explored in human studies ([Studenski et al., 2006](#)).

Having an "enriched environment" seems to be the key to improving cognitive capacity.

Having an "enriched environment" seems to be the key to improving cognitive capacity. Such an environment comprises increased opportunities for physical activity, learning, and social interaction. In their experiments using animal models, Kempermann, Kuhn, and Gage ([1997](#)) found that even a short-term exposure to such an environment led to a striking, five-fold increase in new neurons, along with a substantial improvement in behavioral performance. They observed more learning, more exploratory behavior, and more locomotor activity in enriched environments. These results are strong evidence that signs of neuronal aging in humans can be diminished by sustaining an active and challenging life, even if these stimulating activities start later in life. There are both cognitive and physical pursuits which, if performed to an appropriate level of intensity and frequency, will promote various benefits for older adults. For example, an eight-year, longitudinal study of over 1,000 older adults in Finland found that higher levels of physical and leisure activity were associated with, and predictive of mental well-being in later life, thus suggesting these activities are appropriate target areas for prevention of cognitive decline ([Lampinen, Heikkinen, Kauppinen, & Heikkinen, 2006](#)).

Cognitive Activities

Cognitive scientists study cognition in terms of specific functions, such as attention, recall, expressive and receptive language, motor

coordination, and executive functions that include planning and problem solving as well as stress management and emotional modulation. Many researchers, as well as the general public, believe that these skills inevitably decline with age. Hence, there have been quite a few attempts over the past decades to train people in these specific functions as a defense against time. In general, results of empirically supported studies using healthy older adults suggest that specific skills can be improved when targeted by an intervention ([Studenski et al., 2006](#); [Willis et al., 2006](#)).

A few studies have found evidence of generalized benefit from cognitive training programs. For example, the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study ([Willis et al., 2006](#)) showed that cognitive training in the areas of reasoning, memory, or speed of processing improved cognitive function in adults 65 years and older who are living independently, and the improvement lasted at least five years, if there was some booster training. The benefits of all types of cognitive training were detectable on the specific trained skill after five years, but only training in reasoning ability had a self-reported impact on preserving ability to function well in everyday life.

One emerging and promising area of research is the design and evaluation of interventions that offer ecologically valid activities in "real life" environments, because of their increased likelihood for acceptance and adherence by older adults. One example is the Experience Corps (EC) project that has forged a partnership between older adults and the public schools ([Glass et al., 2004](#)). In this project, teams of older adults worked in elementary school classrooms where they participated in teaching literacy and math skills as well as conflict resolution. Older adults deemed at the greatest risk for cognitive impairment who participated in this project showed improvement in executive functioning and memory skills ([Carlson et al., 2004](#)).

Another innovative program is the first intergenerational Charter School in Cleveland, Ohio. In this program, children aged six to twelve learn in the company of older adults, some of whom have been diagnosed as having Alzheimer's Disease ([Whitehouse & George, 2008](#)). The program, initiated in 2003, creates opportunities for older adults to contribute to their community by sharing their knowledge and experience, while exercising multiple cognitive skills. Specific activities are described on the school website <www.tisonline.org/>. The long-term cognitive benefits of participating in such a program are not yet known, but anecdotal evidence suggests that volunteering in this award-winning program enhances quality of life for the older adult while providing service in the community.

Physical Activities and Cognition

Physical fitness training, specifically aerobic training, has been found to have robust benefits for cognition. In the original 2003 article, the work of Colcombe and Kramer ([2003](#)) was cited as evidence of the relationship between physical activity and cognition. In our 2003 article we noted these researchers had concluded that when it came to the question of whether or not aerobic fitness training is beneficial to the older adult, the researchers had provided an unequivocal yes. While Colcombe and Kramer were successful in validating the beneficial effects of physical activity on cognition, they noted that numerous moderating effects, such as type of fitness training, program duration, session duration, and their respective influences on the effectiveness of the training, need to be considered in future research.

...new evidence has surfaced that has further validated the role of aerobic conditioning in the preservation of cognition.

Spiridusso, Poon, and Chodzko-Zajko ([2008](#)) observed that there are moderators, e.g., age, gender, or education, and mediators, e.g., physical activity, physical resources, disease state, or mental resources that influence the effectiveness of physical activity on cognition. While it is often stated in the literature that physical activity has an effect on one's cognitive ability, including one's ability to learn, retrieve, and problem solve, Spiridusso et al. have suggested that there are mediating factors, such as our physical resources, our disease state, and our mental resources that influence just how well physical activity will work in effecting a positive change in cognition. Further, they have observed that moderating factors, such as age, gender, education, estrogen levels, and genotype, must be considered. The reader is directed to the book, *Exercise and Its Mediating Effects on Cognition*, by Spiridusso et al. for a more complete discussion of this particular topic.

More recently, new evidence has surfaced that has further validated the role of aerobic conditioning in the preservation of cognition. Colcombe et al. ([2006](#)), in an effort to determine whether aerobic fitness training of older adults increased brain volume in regions associated with age-related decline, subjected two groups of volunteers to either six months of aerobic training or six months of toning and stretch training (20 young adults served as controls and underwent no training). It was determined that the training promoted significant increases in both grey (the neurons of the cortex) and white (the connecting pathways) matter regions. Their evidence suggests that cardiovascular fitness and training is associated with the sparing of brain tissue in aging humans, and with maintaining and enhancing cognitive functioning in older adults.

Cognitive, Physical, and Social Functioning

Cognitive training alone and physical training alone each have benefits for cognitive function. However, when an individual engages in both types of training, there appears to be a multiplier effect in which each enhances the impact of the other. Olson et al. ([2006](#)) noted that the two work together to enhance cognitive function, especially in the hippocampus where learning occurs. Oswald et al. ([2006](#)) provided cognitive, physical, and also psycho-education training together. They reported that over a five-year period, they observed significant training effects, including fewer depressive symptoms in the participants compared to a control group, which did not receive the training.

Newson and Kemps (2006), too, found that the combination of physically and cognitively stimulating activities was related to better cognitive performance. In their study, participants recorded their engagement (time and effort) in such physical activities as running, swimming, and jogging; and cognitive activities, such as reading a book and completing crossword puzzles. They were then tested on a visual imagery task which made demands on cognitive function. By choosing this task for their test, Newson and Kemps claimed that the results of their study are indicative of a broad range of cognitive demands people face. The data analysis suggested that cognitive activities promoted performance on complex cognitive tasks better than the physical activity, but both physical and cognitive activity promoted general cognitive function. The authors concluded that both physical and cognitive stimulation offer protection against cognitive decline with age, but likely take different paths in doing so.

Meaningful activities are those that require skill, concentration, feedback, deep involvement, and also a sense of flow, i.e., loss of awareness of the passage of time due to focused concentration (Hartman-Stein & Potkanowicz, 2003). Professionally conducted, community-based cultural programs are examples of such activities. In a study of 166 healthy older adults, participants were assigned to a singing chorale intervention or comparison group of usual activities and were followed for 12 months (Cohen et al., 2006). The intervention group reported better morale and less loneliness, as well as a higher overall rating of physical health, including less medication use, fewer doctor visits, and fewer instances of falls. This positive effect suggests that organized group activities have potentially important health promotion and disease prevention benefits.

Additionally, Cohen et al. (2006) identified health-promoting activities for older adults, to be those that provide either a sense of mastery, and/or require the involvement of simultaneous bilateral brain involvement, and/or include meaningful social engagement. Fave and Massimini (2005) surveyed people from several cultures on the psychological features of optimal activity in daily life. They consistently found that optimal experience was most closely associated with activities that were complex, highly structured, and enjoyable, and that provided opportunities for self-expression, required a high level of concentration to do the task, and would lead to skill development. Stern (2006) stated that what seems to matter is that there be a variety of activities both intellectual and social in nature that are challenging to the individual.

Commercial Brain Fitness Products

Several commercial brain exercise products are currently available such as Posit Science's "Brain Fitness," "My Brain Trainer," and Nintendo's "Brain Age" programs. Some of these are listed in Table 2. Currently, though, there are more commercial products designed as brain exercises than there are empirically supported research studies of the effectiveness of these products. Based on her review of the current literature, LaRue (2008) concluded that there is no one cognitive activity or combination of activities that can currently be identified for reducing the risk of dementia. She made the following cognitive-activity recommendations for older adults:

- Carve out time for cognitively stimulating activities that have been enjoyable throughout your life.
- Add some new challenging pursuits, as time and energy allow.
- Aim to engage in cognitively challenging pursuits several times a week.
- Participate in social interactions.

Table 3 provides a listing of self-help books and consumer education related to brain fitness. The sources cited throughout this paper speak with one voice: the characteristics of activities that people most want to engage in are challenging, require skill, allow the person to get involved at a deep level, and at least some of the time, have an element of social involvement.

Summary

In summary, as was the case in the original article from 2003, "the news for the baby boomer generation is indeed positive regarding their upcoming late life years" (Hartman-Stein & Potkanowicz, 2003). The research community has provided evidence that just as physical exercise benefits the body, so also exercising the brain can have protective and enhancing effects. We are beginning to gather the evidence that just as physical exercise is not only good but also necessary for the body, so also cognitive challenge is necessary to keep the brain working well. These new understandings make it an exciting time to contemplate the future of aging, a time when older adults can be fully functioning without the prevalence of some of the declines and deficits that we have here-to-fore accepted as an unavoidable side effect of getting older.

...we, as fitness and healthcare professionals, must champion the cause of making regular physical activity and cognitive training a part of every Baby Boomer's daily life.

The Next Wave

As was stated at the beginning of this article, on October 15th 2007, Kathleen Casey-Kirschling became the first of the Baby Boomer generation to ride the silver tsunami by applying for her social security benefits. The actual definition of a tsunami is a series of waves. With the expectations of the first wave of Baby Boomers being as high as they are, the assumption can safely be made that the next wave of Baby Boomers and the waves of Baby Boomers to follow will have higher and greater expectations for themselves compared to those in the first wave. Simply put, they will want more out of life in their later years compared to their predecessors. In order to accommodate them we, as

fitness and healthcare professionals, must champion the cause of making regular physical activity and cognitive training a part of every Baby Boomer's daily life.

Table 1. Comparison Table - Physical Activity: Recommendations for Older Adults, 2003 vs. 2007		
Category	2003 Physical Activity Recommendations (Hartman-Stein & Potkanowicz, 2003)	2007 Physical Activity Recommendations (Nelson et al, 2007)
Aerobic Activity (i.e. cardiorespiratory fitness)	3-5 days/week 30-60 minutes accumulated time 55-90% of Maximum Heart Rate	Minimum 30 minutes, on 5 days each week at moderate intensity (5-6 on a 10-point [pt]. scale) Or If capable, 20 minutes, on 3 days each week at vigorous intensity (7-8 on a 10pt. scale)
Muscle Strengthening	Progressive in nature and individualized, 8-10 exercises, consisting of one set of 8-12 repetitions on 2-3 days per week	Minimum 2 non-consecutive days per week, 8-10 exercises, 10-15 repetitions at moderate (5-6 on a 10pt. scale) to high (7-8 on a 10pt. scale) intensity
Flexibility	Participate in flexibility training that addresses the major muscle groups and their respective ranges of motion 2-3 days per week	Participate in flexibility training that addresses the major muscle groups and their respective ranges of motion on at least two days of the week for at least 10 minutes each time
Balance	No formal recommendation Passively addressed as a part of the overall recommendation	Older adults should intentionally pursue and participate in exercise to improve/maintain balance rather than passive inclusion as part of an overall program

Table 2. Brain Activities Websites
<p>Brain games available on the web without charge</p> <p>www.fitbrains.com/games www.gamesforthebrain.com www.freerice.com/index.php</p> <p>Commercial brain fitness programs</p> <p>www.mybraintrainer.com www.cogmed.com www.positscience.com www.calibex.com/nintendo-brain-game www.luminosity.com</p> <p>Brain Fitness Blog</p> <p>www.sharpbrains.com/</p>

Table 3. Resources for Brain Fitness: Self-help Books and Consumer Education
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