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Exploring the Commonalities Between Adaptive Resources and Self-Enhancement in Older Adults' Comparative Judgments of Physical Activity

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Abstract

Objective—This study examines the extent to which optimism, control beliefs and motivation, and downward social comparison contribute independently to the maintenance of older adults' positive self-evaluations in a functional domain.

Method—Adaptive resources/strategies and life satisfaction were measured in personal interviews with 164 community-dwelling older adults. Participants judged their physical activity compared with the average person of their age and wore an accelerometer for 24 hours. Commonality analysis was used to estimate unique versus shared effects of the resource/strategy variables on a residual measure of self-enhancement, obtained by adjusting the comparative judgments for participants' age and objectively measured physical activity.

Results—Self-enhancement was positively related to life satisfaction. Perceived control and optimism had shared positive effects on self-enhancement, whereas downward social comparison had a unique positive effect.

Discussion—Self-enhancement of physical activity plays a part in at least two adaptive profiles with implications for older adults' well-being and health.

Keywords

self-enhancement; life satisfaction; comparative judgments; physical activity; accelerometer

Compared with others of your age, how physically active are you? Would you say you are more active, the same, or less active than the average person of your age? Chances are, if you answered these questions, you rated yourself above average: Most people do, when asked to compare themselves with the average person on a positive dimension, such as their relative abilities, positive features, and chances of success (Alicke & Govorun, 2005). This phenomenon, sometimes called the "better-than-average effect," has proven to be quite reliable—even in studies that have used representative samples, familiar reference groups,

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and dimensions of judgment that can be objectively quantified. Accordingly, it has become known in the psychological literature as a form of *self-enhancement bias*, which is a broader term for the tendency shared by most people at any age to view themselves in unrealistically positive ways (Taylor & Brown, 1988; Weinstein, 1989).

Physical activity is a positive dimension of potential self-evaluation for older adults. To be active at an advanced age signifies that one does not face or has managed to overcome the most commonly recognized barriers to physical activity in later life. Such age-specific barriers are found in the kinesiology literature to include pain or disability, symptoms of chronic disease, fear of injury, and lack of skill (Brawley, Rejeski, & King, 2003). Furthermore, research in aging and health continues to show new ways in which physical activity can improve an older individual's prospects of maintaining a high level of health and well-being into later and later years. For instance, Sumic, Michael, Carlson, Howieson, and Kaye (2007) recently showed that engaging in physical activity for more than 4 hours/week was associated with an 88% reduction of the risk of dementia, among healthy women in their eighth and ninth decades of life. Menec and Chipperfield (1997) showed a positive relationship between physical activity and life satisfaction in a sample that ranged in age from 67 to 102 years. When older adults make comparative judgments of their physical activity, the stage is set for self-enhancement bias to appear.

Self-enhancement bias is a topic of interest to the study of later life, in part because the ability to nourish a positive self-view may have important adaptive consequences for older adults' health and well-being. Therefore, the present research used the context of making comparative judgments of physical activity to address two issues related to the adaptive value of self-enhancement. The first issue concerns the measurement of self-enhancement, not just in terms of how positive people's self-views are, but how positively biased they are against an objective standard. Physical activity is a dimension of subjective self-evaluation that can also be measured objectively. By collecting both types of measures, we could test in a precise way whether even falsely positive self-views of physical activity are associated with greater life satisfaction in later life. The second issue concerns the overlap of self-enhancement with other conceptually related adaptive resources or strategies, including optimism, control beliefs and motivation, and downward social comparison. By collecting measures of these concepts, we could explore the adaptive profiles of older adults who are relatively prone to evaluate themselves in a self-enhancing way. In particular, we could determine whether self-enhancement is indicative of a single, monolithic profile of successful aging, or instead whether multiple, distinct adaptive profiles involving self-enhancement can be shown to exist among older adults in their 8th through 10th decades of life.

Self-Enhancement and Life Satisfaction

As noted earlier, prior research suggests that self-enhancement can be an asset to maintaining psychological and physical well-being. In the general psychological literature, Taylor and Brown (1988) first showed that having "positive illusions" about oneself was a feature that correlated positively with most criteria of mental health, including happiness and contentment with life. Although these observations occasioned much debate and some

contrary findings (e.g., Colvin & Block, 1994; Paulhus, 1998), subsequent research has shown self-enhancement to be positively associated with specific adaptive resources for mental and physical health, including optimism and perceived control in diverse samples (Klein & Helweg-Larsen, 2002; Radcliffe & Klein, 2002; Taylor, Lerner, Sherman, Sage, & McDowell, 2003a).

Research on aging has confirmed the link between self-enhancement and life satisfaction in later life. For example, in a prospective study of older women who underwent community relocation, Kwan, Love, Ryff, and Essex (2003) showed that the women who made more self-enhancing social comparisons at the time of relocating reported less depression and greater well-being 6 months later. Similar findings with respect to mood and life satisfaction have been reported in studies that experimentally manipulated older adults' opportunity to self-enhance against a given target for social comparison (Bailis & Chipperfield, 2006; Frieswijk, Buunk, Steverink, & Slaets, 2004). The present study follows in this line of examining life satisfaction as an outcome of fundamental interest. However, adding to the potential value of these findings in the context of aging and health is recent evidence of the link between mental and physical health in later life (see review by Keyes, 2005). Thus, Taylor, Lerner, Sherman, Sage, and McDowell (2003b) have shown, even among young adults, that greater self-enhancement is associated with a healthier profile of biological responses to acute, laboratory stressors. Bailis, Chipperfield, and Perry (2005) found, in a sample of older adults, that self-enhancing comparative judgments were prospectively associated with lower odds of hospitalization and greater odds of survival over 6 years.

Although previous research already supports the link between self-enhancement and life satisfaction in later life, one limitation shared by most previous studies is the lack of a closely related objective measure of the same positive dimension(s) on which participants have evaluated themselves compared with the average person of their age. Thus, although one can say that people's comparative judgments will tend to be positively biased on the whole, one usually cannot say with similar confidence which individuals think they are further above average than they really are. Clearly, it is possible for individuals to hold extremely positive self-evaluations that are unbiased and for individuals to hold merely average self-evaluations that are quite biased, depending on these individuals' objective performance.

The present study differs from most previous research in having available objective data on older adults' physical activity. These data were obtained by means of an accelerometer, which participants wore on their wrist for approximately 24 hours after they completed the self-report measures of interest to this research. By using the objective measure of physical activity as a baseline for control in our statistical analysis, we could isolate the systematic variability in comparative judgments that was due to self-enhancement. We could then relate this residual measure of self-enhancement to other relevant individual differences that our participants had reported on, including their life satisfaction. We anticipated that participants' comparative judgments of physical activity would remain significantly positively related to life satisfaction, even when we controlled for variability in the amount of physical activity these individuals actually performed.

Self-Enhancement and Adaptive Resources/Strategies

Self-enhancement is theoretically related to several adaptive resources and strategies that promote positive striving and prevent distress in the face of setbacks (Taylor et al., 2003a). These resources and strategies include some psychosocial factors that are also likely to be important to mental and physical health in later life (Aldwin, Spiro, & Park, 2006). The present research focused on four adaptive resources or strategies that answered to both these descriptions: optimism, control beliefs and motivation, and downward social comparison.

Optimism, defined as a general expectation that good rather than bad outcomes will occur in the important areas of one's life (Scheier & Carver, 1985), is thought to promote well-being throughout life in two ways: (a) by encouraging persistence toward personal goals, even in the face of difficulty and (b) by promoting the use of effective, problem-focused coping strategies. The benefits of an optimistic approach to life in the situation of ill health, which affects many older people, were shown dramatically in the prospective study by Scheier et al. (1992) of patients' recovery from coronary artery bypass surgery. In this study, patients who scored higher on a presurgical measure of optimism showed faster postsurgical recovery while in hospital, and both a higher quality of life and fuller return to normal life 6 months later. The conceptual relationship of optimism to self-enhancement is straightforward. Essentially, optimism implies self-enhancement whenever the important life areas in question are really functional capacities, such as physical activity, that an older adult expects to maintain in him- or herself although they are expected to decline with age in most other people.

Control beliefs and motivation share some important features of optimism. Control beliefs refer to an individual's perception that he or she can directly influence important outcomes in his or her life, whereas control motivation refers to the desire for this state. The benefits of having, perceiving, and striving for control in later life have been amply demonstrated in past research with respect to survival, hospitalization, and life satisfaction, among other outcomes (Chipperfield & Perry, 2006; Krause & Shaw, 2000; Menec & Chipperfield, 1997). As with optimism, the benefits of control beliefs and motivation are thought to accrue on account of people's willingness to persist toward controllable (as opposed to uncontrollable) desired outcomes, and the effective, problem-focused way in which people cope with controllable (as opposed to uncontrollable) stressors or setbacks in life. However, unlike with optimism, control beliefs and motivation relate to self-enhancement in an indirect, complex way.

The conceptual relationship between various control-related constructs and self-enhancement is described most fully in the lifespan theory of control, by Heckhausen and Schulz (1995). The lifespan theory relates the manner in which people perceive and strive for control to the decreasing amount of control that is available to them in later life. According to the lifespan theory, people's opportunities for control typically decline with age in adulthood, through the advent of illness, functional limitation, bereavement, or social barriers. However, people's need for control remains a high priority, unabated throughout life. The lifespan theory thus gives an important role to various means of buffering age-

related losses in control, which would otherwise threaten or impair an individual's ability to satisfy this basic need. Self-enhancement figures prominently in this buffering role.

For instance, Heckhausen and Krueger (1993) asked young, middle-aged, and older adults to rate the changes they expected to occur to them personally and to most others in both desirable and undesirable attributes, in each decade of the adult lifespan. Participants at every age reported more positive expectations (i.e., greater increase in desirable attributes and less increase in undesirable ones) for themselves than for most others in the second half of the adult lifespan; however, the extent of this self-enhancement effect was significantly greater in middle-aged and older participants than in younger participants. Such moderation of the self-enhancement effect by age makes sense, according to Heckhausen and Krueger (1993), because younger adults, in comparison with middle-aged and older adults, are less immediately threatened by the developmental risks of old age. Not only do younger adults have less immediate need for self-enhancement to buffer these risks, but to gain or maintain control of their lives, they might be relatively better served by using available social comparison information in other ways: such as for honest self-evaluation of their abilities and opinions, or for self-improvement.

Finally, downward social comparison refers to the choice to compare oneself with worse-off others, which usually results in the comparer's feeling better about his or her own circumstances, whatever they may be. The adaptive potential of downward social comparison to maintain self-esteem and psychological well-being in threatening circumstances has become well-known through studies of illness and disability, relationship loss, failure or poor performance, and low social status, among many others (see reviews by Taylor & Lobel, 1989; Wills, 1981). In the context of research on aging and health, Heidrich and Ryff (1993) found that older women who were in better physical health showed a corresponding advantage over other older women in psychological well-being (i.e., a composite measure of life satisfaction and positive affect). However, this advantage in well-being was due in part to the more positive consequences of downward social comparison that the healthier women also reported across several domains, including physical health and coping with aging. Thus, it was not simply feeling better, but feeling better than others, that contributed to the life satisfaction of these healthy older women. This finding illustrates not only the adaptive value of downward social comparison but also the conceptual relationship between it and self-enhancement. When downward social comparison is regarded abstractly as one's general approach to a problem area or life domain (see also Wrosch & Heckhausen, 1999), this approach is likely to provide selective evidence that one is better than the average of one's peers in that area or domain.

In summary, optimism, control beliefs and motivation, and downward social comparison are related conceptually and empirically to self-enhancement and life satisfaction in older adults. The next logical question would seem to be whether these relationships are representative of one underlying process or many. In the single-process view, the developmental risks of aging impose a strong selective pressure on individuals; those who thrive under such pressure are expected to exhibit most or all the aforementioned adaptive qualities in the way they pursue their goals and cope with setbacks. Self-enhancement, in this view, merely indicates the presence of this singular adaptive profile. Thus, older adults

who are highly self-enhancing will tend to be optimists who seek and also perceive themselves to be in control of their lives and who remind themselves often that others may be worse-off than themselves: The real difference is between individuals who have this adaptive profile and those who do not. Taylor et al. (2003a) seem to have had a similar view in mind when they combined a series of adaptive resources and strategies into a single factor and showed it to be positively and linearly related to self-enhancement in a sample of young adults. In the multiple-process view, aging still imposes a selective pressure, but one that admits of several qualitatively different ways of self-enhancing and, of course, benefiting from self-enhancement. Thus, older adults who are highly self-enhancing might be optimists, they might be pessimists who nevertheless feel in control, or they might be individuals who acknowledge a loss of control but engage frequently in downward social comparison.

It is possible to adjudicate empirically between the single- and multiple-process views by using a procedure called commonality analysis in multiple regression (Lindenberger & Pötter, 1998). This analytic procedure decomposes the total variance in an outcome that is accounted for by a set of predictors into percentages that reflect the unique versus shared influences of each predictor. In this case, we could evaluate the percentage of each adaptive resource or strategy's relationship to self-enhancement in the physical activity domain that was unique, rather than shared with the remaining resource/strategy measures. According to the single-process view, we should find that a majority of each resource or strategy's influence is shared with the rest, whereas according to the multiple-process view, we should find that the majority of the influence of at least two of these resources or strategies is unique.

Method

Participants

A total of 232 older adults in the Province of Manitoba (Canada) provided interview data as participants in a wave of the Successful Aging Study (SAS) conducted in 2003. Of them, 198 (85%) also provided accelerometry data. SAS participants were recruited from the panel of a substantially larger, 30-year longitudinal study of aging, called Aging in Manitoba (AIM). This panel was a representative sample of community-dwelling older adults who were more than the age of 77 and residing in the Province of Manitoba (Chipperfield, Havens, & Doig, 1997). To be eligible for the SAS, participants met the following additional criteria: (a) willing and able to participate in further interviews following the AIM wave of 2001; (b) residing in or near to 1 of 3 metropolitan areas of Manitoba and not in an institution; (c) needing no assistance from a proxy respondent; (d) reporting English as the language of choice for their AIM 2001 interview; and (e) exhibiting no severe memory loss or confusion. Such participants, compared with participants in the AIM study, were younger (M = 83 vs. 85 years in 2001, $t(231) = -7.51$, $p < .001$), more highly educated (M = 10.5 vs. 8.9 years, $t(230) = 5.17$, $p < .001$), more affluent (M = C$20,389 vs. C$17,064 annual income, $t(231) = 5.17$, $p < .001$), and more independent (M = 9.3 vs. 7.3 independent activities of daily living, $t(231) = 15.39$, $p < .001$).

The sample for this analysis was further restricted to 164 individuals (83% of eligible participants with accelerometry data) who identified at least one frequent activity or task that had become more difficult for them to do with age. (Those who identified no such activity or task were not asked about their use of adaptive strategies including downward social comparison. However, participants who identified an activity restriction, compared with those who did not, showed no significant difference in their objectively measured daily activity level.) The average age in this sample was 85 years and the range in age was 79 to 98 years. A total of 66% of the respondents were female, and 38% were currently married.

Measures

Life satisfaction—The Life Satisfaction Index A by Neugarten, Havighurst, and Tobin (1961) is a 20-item inventory that has been implemented and scored in various ways in different studies of aging since it was first introduced. A comprehensive review of this literature and set of confirmatory factor analyses by Helmes, Goffen, and Chrisjohn (1998), which we independently replicated in our SAS data (Swift, Bailis, Chipperfield, Ruthig, & Newall, 2008), provided the 8-item and 3-factor structure and scoring procedure used here to capture past-, present-, and future-oriented aspects of life satisfaction. Participants' responses to each item are limited to *agree*, *disagree*, or *not sure*. Therefore, the summary score for each factor is really a count of the clear *agree* responses to pro-trait items and *disagree* responses to con-trait items. Three items assess life satisfaction regarding the past, including "I would not change my past even if I could." Three items assess life satisfaction regarding the present, including "These are the best years of my life." Two items assess life satisfaction regarding the future, including "I expect some interesting and pleasant things to happen to me in the future." The low number of items per factor, together with the limited response range of these items, makes it difficult to apply conventional statistics to the assessment of reliability of the Life Satisfaction Index A. To evaluate the internal consistency of each subscale, we used a statistic known as Cramér's φ'. This statistic is an index of contingency that approximates a correlation coefficient for nominal or ordinal data that can be arranged in a fourfold table (Hays, 1981). We computed Cramér's φ' for each pair of items in each subscale of the Life Satisfaction Index A and found the average to be .34 for the past and present subscales, which corresponds to $\alpha = .61$ for these 3-item measures. For the 2-item future sub-scale, Cramér's φ' was lower, although still significant, at .18. We retained the subscale, taking into consideration the earlier factor-analytic research and the observation that this study's results varied across the three subscales in meaningful ways.

Comparative judgments of physical activity—Participants answered four consecutive questions about their activity level compared with others of the same age: (a) "How would you compare yourself to others your age, when it comes to your desired physical activity level?" (b) "In general, compared to others your age, how much energy do you have?" (c) "In general, compared to others your age, how active are you? Active refers not to exercise but to the amount you physically move around" and (d) "Now, thinking about the past few months, how would you rate your physical activity?" The response scales varied slightly across these items. Item (a) used a 5-point scale with labels at each point for *much better off*, *better off*, *about the same*, *worse off*, or *much worse off*. Items (b) and (c) used a 7-point

response scale with labels at each end point and the midpoint for *much less*, *the same*, or *much more*. Item (d) used a 7-point response scale with labels at each end point and the midpoint for *extremely inactive*, *moderately active*, and *extremely active*. Participants' responses to the 4 items were first scored consistently so that higher numbers represented more activity, then standardized (due to the different response scales), and then averaged to create a composite measure of comparative judgments of physical activity. The composite measure showed acceptable internal consistency, $\alpha = .84$.

Adaptive resources/strategies—Optimism was measured using the 8-item Life Orientation Test (Scheier & Carver, 1985). The 4 pro-trait and 4 con-trait items, such as "In uncertain times, I usually expect the best" or "If something can go wrong for me, it will," all are designed to assess the respondent's expectations of success in general. The internal consistency of these items was acceptable in the present sample, $\alpha = .75$. Therefore, we averaged each participant's responses to the 8 items on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*) to obtain summary scores for optimism, $M = 4.3$, $SD = 0.7$.

Perceived control was measured initially with the item, "How do you generally feel regarding your level of control in life?" This item was asked a second time, much later in the interview. Participants answered each time on a scale from 1 (*almost totally out of control*) to 10 (*totally in control*). A third item was asked in the context of a series of ratings of "the extent to which you feel you can personally influence things by what you do or say." The final rating in this series was of "your life in general," to which participants responded again using a scale from 1 (*almost no influence*) to 10 (*total influence*). Although asked at different times during the interview, participants' responses to these three items on perceived control showed an acceptable level of internal consistency, $\alpha = .80$. Therefore, the three items were averaged to provide a summary score on participants' general perceived control, $M = 7.7$, $SD = 1.5$. Control motivation was assessed using 6 items from Burger and Cooper's (1979) Desirability of Control scale. These 6 items represented a single factor, which was labeled "general desire for control" in the original scale. Participants responded to each of these items, such as "I enjoy making my own decisions," using a scale from 1 (*strongly disagree*) to 6 (*strongly agree*). Participants' responses to the 6 items showed acceptable internal consistency, $\alpha = .79$, and these responses were averaged to provide a summary score on general desire for control, $M = 4.4$, $SD = 0.8$.

Finally, downward social comparison was measured through a series of ratings of how often participants engaged in particular strategies, when confronting restrictions on a particular activity or task. The activity or task was self-identified by the participants at an earlier point in the interview. The 5 items on downward social comparison reflected telling oneself, at such times, that others have worse problems: For example, "How often do you tell yourself that despite this problem, you are better off than many others?" Participants responded using a 0–4 scale, with points labeled *never* (0), *rarely* (1), *sometimes* (2), *often* (3), or *almost always* (4). The five items showed acceptable internal consistency, $\alpha = .84$, and these items were averaged to provide a summary score for the participants' frequency of using downward social comparison, $M = 2.7$, $SD = 0.8$.

Accelerometer—At the beginning of each interview, with the participant's specific consent, the interviewer initialized an ActiGraph accelerometer (Chipperfield, in press; MTI Health Services, 2000) and fastened it firmly over a sweatband to the participant's nondominant wrist, using velcro straps. The device was oriented consistently so that a notch on the outer casing faced the participant's elbow.

Participants wore the ActiGraph for approximately 24 consecutive hours, during which time they were asked to maintain their usual activities. The ActiGraph sampled acceleration (in milliGs) at the rate of 10 times per second. These samples were summed every 1 minute into an activity count, which the ActiGraph recorded. The average minute-by-minute activity count over approximately one day thus provided a measure of each participant's activity level.

Previous studies have found activity counts to be capable of distinguishing active from passive activities and to be highly correlated with energy expenditure and heart rate during exercise (Tyron & Williams, 1996). Using the wrist as the measurement site captures the upper body movements involved in everyday physical activities that occur while sitting (e.g., sewing, playing cards) or standing (e.g., dishwashing). Studies also have found the wrist to be the most accurate single measurement site for predicting energy expenditure and oxygen consumption during exercise (Melanson & Freedson, 1995). In the SAS data set, we have found that activity counts are similar across days of the week versus weekend days and days described as more or less active than usual versus a typical day (Chipperfield, in press; Chipperfield, Newall, Chuchmach, Swift, & Haynes, in press).

When retrieving the ActiGraph, the interviewers also gathered information from the participants about their times of sleep and waking and how typical a day it had been in terms of physical activity. Our analyses reached identical conclusions when we used all the available data or data from only those times when the participants said they were awake and wearing the device or data from only those cases who said that they had had a typical day. We report the analyses using all the available data.

Results

Self-Enhancement and Life Satisfaction

The first part of our analysis addressed the benefits to older adults' life satisfaction that might be associated with the degree of self-enhancement in their comparative judgments of physical activity. We began, as noted earlier, by separating life satisfaction into three temporal aspects: that is, satisfaction in contemplating one's past, present, and future. For each aspect, we developed three multiple regression models.

In all three models, we entered age and objectively measured physical activity ahead of the other predictors. This step was specified a priori to isolate the variability in comparative judgments of physical activity that was not corroborated or accounted for by the objective measures. Model 1 then added the comparative judgments alone. This step allowed us to assess the incremental prediction of each aspect of life satisfaction that could be attributed statistically to self-enhancement in the relevant domain. Model 2 added the adaptive

resource and strategy measures together with comparative judgments. This step allowed us to assess the amount of overlap between these measures and self-enhancement in predicting each aspect of life satisfaction. Model 3 dropped comparative judgments but retained the adaptive resource and strategy measures as predictors. This step allowed us to assess whether any one of these measures showed a relationship to any aspect of life satisfaction, when self-enhancement was not included in the model, that was meaningfully different from when self-enhancement was included in the model.

Table 1 shows the results of our tests of Models 1, 2, and 3 for each aspect of life satisfaction. Our Model 1 tests showed comparative judgments of physical activity to be positively related to each aspect of life satisfaction, after controlling for age and objectively measured individual differences in physical activity. These relationships were statistically significant for the past and present aspects of life satisfaction, and nearly so for the future aspect, with $p < .07$. Thus, positively biased or self-enhancing judgments of physical activity were associated with greater life satisfaction regarding our participants' past experiences and present circumstances, and the evidence was suggestive of a similar trend regarding our participants' future plans.

Our Model 2 tests showed that the addition of adaptive resources and strategies to the previous model produced little or no change in the influence of comparative judgments (i.e., self-enhancement bias) on life satisfaction regarding the past or future. Thus, it was only in the case of participants' satisfaction with their life at present that a majority of the variance accounted for by self-enhancement bias (83%) was shared with the adaptive resource and strategy measures.

Our Model 3 tests gave further insight into the relationships of specific adaptive resources or strategies to each aspect of life satisfaction. An unsurprising, almost definitional finding was that optimism was significantly positively related to participants' life satisfaction regarding their future plans. More surprising to us, however, was that downward social comparison showed a significant negative relationship to this aspect of life satisfaction. This negative relationship would serve to mask or work against the influence of both optimism and self-enhancement on life satisfaction regarding the future. It also opposed the positive influence of downward social comparison on judgments of life satisfaction regarding the present.

Self-Enhancement and Adaptive Resources/Strategies

The second part of our analysis was concerned with the diversity of adaptive profiles that might correspond with self-enhancement in the physical activity domain among an older sample. We began by considering a pattern of simple correlations that could decisively disconfirm the single-process view of self-enhancement in aging. That pattern would be if each of the adaptive resources or strategies we had measured were related positively to self-enhancement, and all were unrelated to one another. Table 2 presents the relevant correlations among participants' comparative and objective physical activity, age, and the four adaptive resource/strategy measures: that is, optimism, control beliefs and motivation, and downward social comparison. As Table 2 shows, the simple disconfirmation pattern did not occur. Each of the adaptive resources or strategies was indeed positively related to self-enhancement, but all were positively related to one another as well. Thus, these simple

correlations left the basic question unresolved, whether one or multiple adaptive profiles might be needed to account for the set of variables that were positively correlated with comparative judgments of physical activity.

To resolve this question, we performed the multivariate analyses reported in Table 3. Model 1 included objective physical activity, age, and all the adaptive resource/strategy measures as predictors of participants' comparative judgments of physical activity. Again, we could regard higher comparative judgments as evidence of self-enhancement in the relevant domain because we controlled for participants' age and objectively measured physical activity in these analyses. Our Model 1 tests revealed that higher dispositional optimism, greater perceived control, and more frequent use of downward social comparison each related independently and significantly to self-enhancement. Only participants' perceptions of the desirability of control had no significant independent relationship to self-enhancement.

Models 2 to 5 then dropped each adaptive resource or strategy from the set of predictors in turn. These tests revealed that dispositional optimism and perceived control had a shared as well as a unique influence on self-enhancement of physical activity: that is, each predictor's influence grew when the other predictor was dropped (compare Models 2 and 3 with Model 1). Following procedures described by Lindenberger and Pötter (1998), we calculated the percentage of each predictor's influence that was shared between the two. The shared portion accounted for 76% of the variability in self-enhancement that was associated with optimism and 57% of that which was associated with perceived control. Thus, the majority of either variable's influence was really shared between the two. Furthermore, participants' self-rated frequency of using downward social comparison had a significant positive effect on self-enhancement bias that proved to be statistically independent from the effects of either dispositional optimism or perceived control.

Discussion

The aims of this research were to answer two questions about the adaptive value of self-enhancement in aging. The first question was whether even falsely positive views of one's capacity in the functional domain of physical activity would be positively related to life satisfaction in an older sample. The second question was whether the self-enhancement of physical activity in later life is best viewed as an indicator of one or several adaptive profiles that might be composed of high optimism, high control beliefs and motivation, and/or frequent use of downward social comparison. Our results provide clear answers to both these questions.

First, our participants' comparative judgments of physical activity remained positively related to life satisfaction, regarding these participants' past, present, and future, even when we controlled for their age and objectively measured physical activity level. These findings confirm the suspicion widely promulgated, but less often tested in past research, that even falsely positive views of one's physical activity are associated with greater life satisfaction in later life. Second, it was only in the case of participants' judgments of their life satisfaction at present that we detected substantial shared variance between self-enhancement and the

measures of optimism, control beliefs and motivation, and downward social comparison. The single-process view of self-enhancement thus began to falter at that point in our analysis. The data continued to be unsupportive through our analysis of the unique and shared relationships of the adaptive resource/strategy measures with self-enhancement. This analysis showed that perceived control and optimism had a shared positive relationship with self-enhancement, whereas downward social comparison had a unique positive relationship. Thus, the older adults in this research who showed the most self-enhancement bias fit into at least two distinct adaptive profiles: those of the in-control optimist, and the downward social comparer.

Some unexpected findings of this research carry additional implications. Optimism indicated an advantage, and the use of downward social comparison indicated a disadvantage, when we examined participants' levels of life satisfaction regarding the future. However, it was downward social comparison and not optimism that indicated an advantage, when we turned to participants' life satisfaction regarding the present. This reversal of the direction and relative importance of these effects supports the validity of the temporal distinction in life satisfaction research (Helmes et al., 1998). Furthermore, these findings may allow us to describe the outlook of older adults with different adaptive profiles, who are also given to self-enhancement in the physical activity domain. Specifically, those who fit the in-control optimist profile may be approaching the various challenges of aging by trying to keep their hopes up for the future, whereas those who fit the downward social comparer profile may be trying to stay engaged in the present. By happenstance, we had asked participants to rate how important it was to be active now, compared with when they were younger, which could be taken to imply some motivation to stay engaged in the present. In line with the current hypothesis, the correlation between this item and using downward social comparison more often was $r = .39$, $p < .001$.

Limitations

The present findings must be interpreted cautiously due to the cross-sectional nature of the data. For instance, it would be inappropriate to conclude that any of the adaptive resources or strategies caused participants to self-enhance in making comparative judgments of their physical activity or that self-enhancement mediated any of these variables' effects on life satisfaction. Indeed, the reverse scenario is equally plausible. That is, a high degree of life satisfaction could be the reason why some older adults are self-enhancing, optimistic, feeling in control, engaging in downward social comparison, and so on (Kwan et al., 2003). The questions that motivated this research did not concern the causal direction of these relationships, but whether they signified one underlying process or many. As noted earlier, and regardless of causal direction, our findings weigh heavily on the side of the multiple-process view of self-enhancement in later life.

The Likert-type response scale of our comparative measure of physical activity obviously did not match that of its objective counterpart in this study, the ActiGraph. If participants' comparative judgments were accurate, however, their correlation with the ActiGraph would approach 1, and there would be only error variance left to analyze as a function of adaptive resources or strategies. Response sets or other shared sources of measurement error could

explain why comparative judgments were more strongly correlated with the life satisfaction and adaptive resource/strategy measures than with the ActiGraph. If any artifact of the method were responsible for these correlations, however, we should not have observed unique effects that were large in comparison with shared effects.

Participants could have included factors in their comparative judgments that were improperly excluded from the ActiGraph data. Consider a prototypical 85-year-old participant who scores near the 50th percentile of the ActiGraph distribution but perceives herself as more active than two-thirds of the senior population. She might be aware of activities in her weekly routine that happened to fall outside our window of observation, for example, or she might be using a reference group for comparison that includes individuals of her own age who were not physically able to take part in our research. Such possible discrepancies could be a part of the phenomenon under study, however, and not a source of error to be controlled, if participants tended to consider these activities or reference points strategically in their judgment process. Test–retest data we have collected on the ActiGraph in a small portion of our sample show a correlation of .77 over 1 year (Chipperfield, in press). The SAS sample, although not representative, still provides a reasonably accurate reflection of the social frame of reference we asked participants to use in making their comparative judgments of physical activity. Moreover, we could verify that participants who were excluded from our analysis due to their having no activity restrictions still did not engage in more everyday physical activity than the included participants who reported one or more restrictions. Thus, we doubt that by observing more days of physical activity or more cases that were excluded from our sample, we would arrive at a different understanding of how self-enhancement relates to the other variables we examined.

Conclusion

Bearing these limitations in mind, our findings suggest that self-enhancement bias, in this case regarding physical activity, is accompanied by greater life satisfaction in later life. Furthermore, self-enhancement bias plays a part in at least two adaptive profiles, defined by perceived control/optimism on one hand and downward social comparison on the other. Although both these profiles involved self-enhancement of physical activity, they were differentially related to participants' life satisfaction regarding the future and the present. On reflection, there may be few tendencies like self-enhancement that can satisfy both a future- and a present-oriented agenda, when normally people experience a trade-off between the two. This ability of self-enhancement to fit into even opposing adaptive profiles might account for some of the observed ubiquity of this bias with which our research began. By the same token, self-enhancement may be a device that is consistently useful to older adults as they approach the end of life and as their priorities change between future- and present-oriented pursuits (Carstensen, Isaacowitz, & Charles, 1999).

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Table 1

Regression of Life Satisfaction in Three Time Frames on Models Composed of Comparative and Objective Physical Activity, Age, and Adaptive Resources/Strategies

	Life Satisfaction								
	Past			Present			Future		
Predictor	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Step 1									
Objective Physical Activity	.09	.08	.10	−.07	−.06	−.05	.04	.03	.04
Age	.11	.10	.11	−.03	.01	.01	−.06	−.07	−.07
Step 2									
Comparative Physical Activity	.23***	.19**	—	.23***	.11	—	.14*	.10	—
Dispositional Optimism	—	.04	.08	—	.07	.09	—	.21**	.23***
Downward Social Comparison	—	−.04	−.01	—	.15*	.17**	—	−.22***	−.20**
Desirability of Control	—	−.03	−.02	—	.14	.15*	—	−.08	−.08
Perceived Control	—	.10	.16*	—	−.01	.02	—	.12	.14
R^2	.07	.08	.06	.05	.11	.10	.03	.11	.10
ΔR^2	.05	.06	.04	.05	.11	.10	.02	.10	.09

Note: Data are standardized regression coefficients. Model 1 included objective activity and age on the first step and comparative judgments on the second step. Model 2 replicated Model 1 and added the adaptive resource/strategy measures on the second step. Model 3 replicated Model 2 without comparative judgments on the second step. Predictors that were not included in a given model are indicated by a dash ("—"). R^2 indicates the total variability in life satisfaction that was associated with all the predictors after Step 2. ΔR^2 indicates the incremental variability in life satisfaction that was associated with the predictors after Step 2 compared with after Step 1. The latter figures were used to calculate unique and shared effects pertaining to comparative judgments and the adaptive resource/strategy measures reported in the accompanying text.

* $p < .10$.

** $p < .05$.

*** $p < .01$.

Table 2

Correlations Among Comparative and Objective Physical Activity, Age, and Adaptive Resources/Strategies

	Comparative Physical Activity	Objective Physical Activity	Age	Dispositional Optimism	Perceived Control	Desirability of Control
Objective Physical Activity	.18*					
Age	−.06	−.28***				
Dispositional Optimism	.41***	.05	−.06			
Perceived Control	.48***	.19**	−.05	.50***		
Desirability of Control	.34***	.12	−.21**	.45***	.39***	
Downward Social Comparison	.34***	.01	−.06	.28***	.30***	.35***

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 3

Regression of Comparative Physical Activity on Models Composed of Objective Physical Activity, Age, and Adaptive Resources/Strategies

	Model				
Predictor	**1**	**2**	**3**	**4**	**5**
Objective Physical Activity	.11	.10	.16*	.11	.10
Age	.02	.02	.04	.01	.02
Dispositional Optimism	.19*	—	.29***	.21**	.20*
Perceived Control	.28***	.35***	—	.30***	.31***
Desirability of Control	.07	.12	.11	—	.11
Downward Social Comparison	.18*	.19**	.22**	.20**	—
R^2	.31	.29	.26	.31	.29

Note: Data are standardized regression coefficients. Model 1 included all predictors. Models 2 to 5 included all predictors but the one indicated by a dash ("—"). The difference in R^2 between Model 1 and Models 2 to 5 equals the unique effect size of the dropped predictor.

* $p < .05$.

** $p < .01$.

*** $p < .001$.