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Conflicted Goal Engagement: Undermining Physical Activity and Health in Late Life

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Objectives. Pursuing health goals in very old age is a challenging task that may be undermined by conflicted goal engagement involving mismatched primary (behavior-focused) and secondary (motivation-focused) control striving. Our study explored whether one potentially detrimental combination of control strategies (low primary control/high secondary control) compromised 3-year indicators of everyday physical activity and blood oxygen saturation.

Method. We analyzed data from a representative sample of very old adults (n = 107) using simple slope regression analyses that tested the conditional effects of control striving on everyday physical activity and blood oxygen saturation.

Results. We found a *conflicted engagement effect* wherein primary control predicted our outcomes only when secondary control was high. The lowest levels of everyday physical activity and blood oxygen saturation were found for older adults high in secondary control but low in primary control. A supplemental mediation analysis suggested everyday physical activity was the mechanism through which conflicted engagement undermined blood oxygen saturation.

Discussion. Employing health maintenance strategies that promote motivation-focused thinking but discourage goal-directed behaviors (conflicted engagement) may compromise physical activity and health among very old adults. Further research is needed to determine whether control-enhancing interventions promote harmonious goal engagement and better health among these high-risk individuals.

Key Words: Everyday physical activity—Goal engagement—Health and aging—Primary and secondary control.

Whether one desires a job promotion or a reduced waistline, sought after goals are rarely achieved without a strategic investment of goal-directed behaviors (primary control strategies). However, sustaining these goal-focused behaviors for critical long-term objectives (e.g., maintaining health) is an arduous task, particularly for vulnerable older adults who face the prospect of increasing chronic health problems and a declining capacity to actively pursue valued goals (Centers for Disease Control and Prevention, 2013; Heckhausen, Wrosch, & Schulz, 2010). Recent research suggests motivation-focused thinking (secondary control strategies) supports the initiation and maintenance of proactive primary control striving, and employing these strategies in combination makes for the most effective goal engagement (Haase, Heckhausen, & Köller, 2008; Hamm et al., 2013; Poulin & Heckhausen, 2007). In fact, older adults who simultaneously engage in motivation-focused thinking and goal-directed behaviors experience long-term psychological and physical health benefits (Wrosch & Schulz, 2008; Wrosch, Schulz, Miller, Lupien, & Dunne, 2007). Hence, a promising literature suggests that strategically employing *complementary* goal engagement strategies facilitates the attainment of consequential goals.

Notably, however, researchers have yet to explore the health implications of employing *conflicting* or *mismatched* goal engagement strategies, which may be especially harmful in late life. In particular, it might be detrimental for older adults to engage in health maintenance strategies that promote motivation-focused thinking (high secondary control) but undermine goal-directed behaviors (low primary control; Wrosch, Scheier, Carver, & Schulz, 2003). In accordance with the *motivational theory of life-span development* (Heckhausen et al., 2010; Wrosch et al., 2003), we reasoned that negative health consequences should follow from this mismatched combination of strategies: Effortfully maintaining motivation for health goals that are not actively pursued should precipitate a detrimental state characterized by behavioral disengagement and cognitive exhaustion that may undermine physical activity and thus compromise cardiorespiratory health. Our study examined this premise using a sample of very old adults who highly valued their health with the assumption that the negative consequences might be most evident in late life among individuals particularly invested in maintaining their health.

The Effects of Goal Engagement on Older Adults' Health

The motivational theory of life-span development (Heckhausen & Schulz, 1995; Heckhausen et al., 2010) provides a theoretical basis to examine the effects of conflicted goal engagement on older adults' health. Heckhausen and

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colleagues (2010) posit that humans routinely employ four types of control strategies in order to actively engage or disengage from important goals. Our focus was on the two control strategies at the core of goal engagement. *Selective primary control* involves strategies that target external behavioral resources in order to pursue goals (e.g., increasing time spent exercising). *Selective secondary control* involves strategies that target internal cognitive and affective resources in order to sustain volitional goal commitment (e.g., downplaying competing goals before exercising).

Striving for control over one's health is not without consequence, particularly among older adults. In terms of psychological health, selective primary control striving is related to higher positive emotion, lower perceived stress, and better global mental health (Haynes, Heckhausen, Chipperfield, Perry, & Newall, 2009; Windsor, 2009). In terms of physical health, selective primary control striving predicts fewer recent illness symptoms (Haynes et al., 2009), lower severity of chronic symptoms (Chipperfield, Perry, & Menec, 1999; Haynes et al., 2009), better functional status (Wahl, Becker, Burmedi, & Schilling, 2004), fewer hospital admissions (Chipperfield & Perry, 2006), and lower odds of mortality (Hall, Chipperfield, Heckhausen, & Perry, 2010).

Although largely neglected, researchers have begun to examine the unique effects of selective secondary control strategies for adults across the life span. Recent empirical evidence indicates that selective secondary control strategies facilitate primary control striving and goal attainment among young adults facing challenging circumstances (Hamm et al., 2013; Poulin & Heckhausen, 2007). Selective secondary control's protective influence is not limited to young adults, however: Frequently employing these volitional goal commitment strategies are related to higher levels of positive affect and lower levels of depression among older adults coping with macular degeneration (Schilling et al., 2013; Wahl et al., 2004). And yet, this sparse body of empirical evidence highlights the need for further research on the influence of selective secondary control on psychological and physical health, particularly among older adults.

Finally, research by Wrosch and colleagues has documented the positive influence of unmitigated goal engagement on older adults' long-term health. Simultaneously employing complementary selective primary and selective secondary control strategies is related to fewer depressive symptoms, decreased chronic conditions, better functional status, and reduced diurnal cortisol secretion (Wrosch & Schulz, 2008; Wrosch et al., 2007). Collectively, this body of research on goal engagement strategies demonstrates that selective primary and selective secondary control benefit older adults' health when employed individually or in combination.

However, several significant gaps remain in the literature. First, although previous research has examined the influence of control striving on a variety of physical health outcomes among older adults (e.g., illness symptoms, chronic conditions, cortisol secretion), critical indicators of cardiorespiratory health have been largely neglected. This omission is surprising given the availability of pulse oximeters, which provide a reliable, economic, and noninvasive measure of cardiorespiratory efficiency. More specifically, pulse oximeters measure the percent oxygen saturation in the arterial blood (%SpO_2), with higher values representing greater efficiency and healthy older adults scoring approximately 95% (Netzer, Eliasson, Netzer, & Kristo, 2001).

Past research suggests the value of using pulse oximetry to measure cardiorespiratory health, as there are serious health consequences for individuals with low levels of blood oxygen saturation. Low saturation is linked to depleted energy, weakness, and motor deficits (Amann, 2012; Frohnhofen, Heuer, Pfundner, & Orth, 2007; Virués-Ortega, Buela-Casal, Garrido, & Alcázar, 2004). Reductions in blood oxygen saturation (i.e., a 4% or more decrease) are also implicated in sleep apnea, which is in turn related to a host of health conditions, including hypertension, coronary artery disease, arrhythmias, heart failure, ischemic stroke, and even mortality (see Bradley & Floras, 2009; Nieto et al., 2000; Shah, Yaggi, Concato, & Mohsenin, 2010). Further, several studies have demonstrated that low blood oxygen saturation directly predicts increased odds of hospitalization and mortality (Majumdar, Eurich, Gamble, Senthilselvan, & Marrie, 2011; Paciocco et al., 2001). Most striking, survival analyses conducted by Paciocco and colleagues (2001) revealed that each percent decrease in blood oxygen saturation corresponded to a 10% increase in risk of death. Thus, empirical evidence is needed to determine the influence of control striving on this important indicator of cardiorespiratory health.

Second, although the effects of control striving on physical health outcomes have been well documented (see Heckhausen et al., 2010), there is a dearth of evidence exploring the intervening mechanisms. One logical mediator in the control–health relationship may be physical activity. Compelling evidence suggests that physical inactivity undermines health, as evidenced by skin deterioration, swollen extremities, weakened muscles, and abnormal changes in metabolic rates, body chemistry, and blood volume (see Mott, Poole, & Kenrick, 2005).

Most pertinent to the study of older adults, research by Chipperfield and colleagues suggests that everyday physical activity may be an important determinant of health in very old age. Conceptually, everyday physical activity comprises simple, physical movements that occur as individuals navigate their day-to-day lives as opposed to periods of intense physical activity that characterize exercise (Chipperfield, 2008). Because physical activity steadily declines with age (Chipperfield, 2008; Shaw, Liang, Krause, Gallant, & McGeever, 2010; Stahl & Patrick, 2012; Talbot, Metter, & Fleg, 2000), this form of everyday movement may be especially critical for older adults striving to maintain their health.

Empirical evidence supports this supposition, as everyday physical activity in later life has been linked to better psychological well-being (improved self enhancement, self esteem, and optimism) and better physical health (better global physical health, fewer recent health symptoms, and lower severity of chronic conditions; Bailis, Chipperfield, & Helgason, 2008; Bailis, Chipperfield, Perry, Newall, & Haynes, 2008; Chipperfield, Newall, Chuchmach, Swift, & Haynes, 2008; Ruthig & Chipperfield, 2007). Further, even when accounting for variation in age, health status, functional status, and psychological status, everyday physical activity predicts mortality, with very old sedentary adults more than 3 times as likely to die over a 2-year period than their active peers (Chipperfield, 2008). Thus, logic, theory, and empirical evidence converge to suggest that everyday physical activity may provide one mechanism through which control striving positively affects physical health among very old adults.

Third, although several studies have documented the health benefits of unmitigated goal engagement (Wrosch & Schulz, 2008; Wrosch et al., 2007), researchers have yet to explore the health consequences of conflicted goal engagement. According to Heckhausen and colleagues (2010), selective primary and selective secondary control strategies should be most adaptive when exercised in combination because the fundamental purpose of selective secondary control is to sustain selective primary control striving when unexpected obstacles challenge one's goal pursuit. An exclusive reliance on one set of goal engagement strategies to the neglect of the other would represent goal pursuit characterized by partial goal engagement (e.g., high secondary control) and partial goal disengagement (e.g., low primary control). Hence, notwithstanding the fact that selective primary and selective secondary control benefit health both independently and additively, goal pursuit marked by a discordant use of these strategies may actually have detrimental effects, especially among older adults coping with age-related health challenges.

Consequently, our study addressed these limitations in past research by examining the impact of conflicting selective primary and selective secondary control strategies on 3-year everyday physical activity and cardiorespiratory health among very old adults. Based on the motivational theory of life-span development (Heckhausen et al., 2010), we expected that individuals who frequently engage in secondary control strategies but infrequently employ primary control strategies would be at high risk of physical inactivity and poor cardiorespiratory health: Because secondary control strategies are ultimately intended to promote and sustain primary control striving (Heckhausen et al., 2010), older adults who employ the former in the absence of the latter should experience a dissonant state in which motivation to sustain health is high but the enactment of health behaviors remains low. Thus, we predicted a *conflicted engagement effect* in which older adults who mismatch low primary control striving with high secondary control striving (high risk) would engage in reduced physical activity and experience worse cardiorespiratory health relative to their peers who match their high primary control striving with high secondary control striving (low risk).

Note that although low secondary control/high primary control may also represent a form of conflicted goal engagement, this combination of strategies should not prove detrimental. According to Heckhausen and colleagues (2010), maximizing primary control striving is the key criterion for adaptive development, and employing these behavior-focused strategies is a strategic approach to goal engagement whether or not supporting selective secondary control strategies are used.

We were equally interested in whether long-term everyday physical activity might provide a mechanism through which conflicted engagement impairs cardiorespiratory health. The logic for expecting everyday physical activity to mediate this relationship is based on past research indicating physical activity increases oxygen demand in the muscle cells, resulting in an increase in heart rate and cardiac output of oxygenated blood (Vander, Sherman, & Luciano, 1994). Hence, higher levels of physical fitness result in greater amounts of oxygenated blood being pumped through the body with each heartbeat and promote more efficient oxygen exchange at the capillary level (Vander et al., 1994). Thus, our mediation hypothesis was that conflicted engagement should undermine everyday physical activity, which, in turn, should compromise cardiorespiratory health.

Method

Participants and Procedures

Our study involved participants from the Aging in Manitoba (AIM) Project who also took part in the satellite Successful Aging Study (SAS; see Chipperfield, Campbell, & Perry, 2004 for a detailed description of SAS and AIM). AIM is one of the largest (n = 8982) and longest-running (1971–2006) population-based studies of aging. Participants were selected using stratified random sampling procedures and interviewed in 1971 (new waves added in 1976, 1983), with follow-up interviews conducted in 1983, 1990, 1996, 2001, 2005, and 2006. The SAS project involved conducting interviews with community-dwelling AIM participants (1996, 2003, 2006) to obtain more focused information on psychosocial and health-related variables. The sample for the present study was restricted to SAS participants from 2003 to 2006 (n = 107) because this was the first point at which data were obtained for all variables of interest. Data from these cohorts were gathered using face-to-face interviews over the course of two visits in both 2003 and 2006. Our independent variables and covariates were measured in 2003, whereas our dependent variables were measured in 2006. In 2003, our participants were 80–97 years old (M = 83.86) and the majority were female (68%).

Covariates (2003)

Demographic variables.—Participants provided information on their age, gender, annual income, and years of education. See Table 1 for a summary of the study variables.

Functional restrictions.—Participants were presented with a list of 21 common health conditions and subsequently indicated (no/yes) whether they experienced each condition (e.g., arthritis, cancer, diabetes, etc.). Participants then rated how often each reported condition restricted their activities during the past year (0 = *never*, 4 = *almost always*). Scores were summed, with higher scores indicating greater functional restrictions.

Classification Variable (2003)

Health value.—Participants rated how much they valued their health by responding to the following question: Compared to when you were younger, how important is good health (0 = *less important*, 1 = *about the same*, 2 = *more important*)? Because only one participant rated his/her health as less important, we collapsed scores of 0 and 1.

Independent Variables (2003)

Primary control strategies.—The Health Engagement Control Strategies scale (HECS; Wrosch, Schulz, & Heckhausen, 2002) measured selective primary control striving. Participants rated the extent to which they engaged in three primary control strategies using a 5-point scale (1 = *almost never true*, 5 = *almost always true*; e.g., "I invest as much time and energy as possible to improve my health").

Secondary control strategies.—The HECS scale (Wrosch et al., 2002) also measured selective secondary control striving. Participants rated their use of two secondary control strategies using the same 5-point scale (1 = *almost never true*, 5 = *almost always true*; "When I decide to do something about a health problem, I am confident that I will achieve it"; "Once I decide what I need to do to improve my health, I avoid things that could distract me from doing these things").

Dependent Variables (2006)

Everyday physical activity.—We assessed objective everyday physical activity using ActiGraph uniaxial accelerometers that measured participants' movement during a 1-day period (Model 7164, MTI Health Services, 2000). Consistent with previous research, these mechanical, computerized motion recorders were placed on each participant's nondominant wrist prior to commencing the Visit 1 interview (Chipperfield et al., 2008; Steele et al., 2003). Wrist placement permitted us to capture minor upper body movements that occur when sitting (e.g., playing cards) or standing (e.g., combing hair). Interviewers returned for Visit 2 approximately 24 hr later on the following day, at which point the accelerometers were removed and the end time was recorded.

The ActiGraph recorders enabled us to document intensity of movement in the vertical plane by capturing accelerations ranging in magnitude from ≈0.05 to 2.0 g, with band widths limited to frequencies between 0.25 and 2.50 Hz (see Chipperfield, 2008 for a detailed description). Accelerometers were programed to record 10 acceleration signals per second. These acceleration scores, or *activity counts*, were automatically summed at the end of each 1-min cycle, which resulted in combining 600 accelerations (10 × 60 s) before the integrator was reset to zero. In line with previous research (Chipperfield et al., 2008), the resulting mean activity count was used as a simple, quantifiable index of physical movement.

The reliability and validity of our 1-day measure of everyday physical activity is supported by the fact that we excluded acceleration data during periods when participants removed the ActiGraph or were in bed at night

Table 1. Summary of the Study Variables

Measures	No. of items	Anchors	α	*M*	*SD*	Actual range
2003 measures						
Age	1	Self-reported age	—	83.86	3.95	80–97
Gender	1	1 = *male*, 2 = *female*	—	1.68	0.47	1–2
Income	1	Annual income	—	21982.43	12166.90	4,800–60,002
Education	1	Years of education	—	10.62	2.66	5–21
Functional restrictions	21	0 = *never*, 4 = *almost always*	—	7.35	7.09	0–31
Health value	1	1 = *about the same*, 2 = *more important*	—	1.76	0.43	1–2
Primary control	3	1 = *almost never true*, 5 = *almost always true*	.84	11.75	2.36	5–15
Secondary control	2	Same	.72	7.96	1.55	4–10
2006 measures						
Everyday physical activity	—	Actigraph reading	—	742.27	296.23	153.23–1539.20
Cardiorespiratory health	—	Oximeter reading (%SpO_2)	—	94.87	1.92	88.00–98.25

Note. SD = standard deviation.

and by past research conducted on this measure. Notably, previous studies demonstrate that this measure remains relatively stable across a 3-day period and has a 1-year test–retest reliability of $r = .77$ (Chipperfield, 2008; Chipperfield et al., 2006; Lambert, 2006). Further, an analysis of variance showed that this activity measure was not subject to a day-of-the-week effect, $p = .60$ (Chipperfield, 2008). Past research also suggests that few participants (10%) engaged in atypical physical activity on the day they wore the ActiGraph, and their mean activity level did not differ from their peers who reported typical levels of activity, $p = .22$ (Chipperfield, 2008). Finally, as reported earlier, this measure of everyday physical activity is related to global physical health, health symptoms, severity of chronic conditions, self enhancement, optimism, self esteem, and even 2-year mortality (Bailis, Chipperfield, & Helgason, 2008; Bailis, Chipperfield, Perry, et al., 2008; Chipperfield, 2008; Chipperfield et al., 2008; Ruthig & Chipperfield, 2007).

Cardiorespiratory health.—Nonin Onyx Sportstat 9500 finger pulse oximeters measured cardiorespiratory health by recording the percentage of oxygen saturation in participants' arterial blood (%SpO_2). These oximeters transmit red (660 nm) and infrared (940 nm) light through the user's finger and are equipped with a photo detector that records the light absorbed by hemoglobin (Nonin Medical Inc., 2007). A microprocessor converts the resulting score into a digital readout of %SpO_2. Higher blood oxygen saturation readings represent greater cardiorespiratory health, with research suggesting healthy older adults score approximately 95% (Netzer et al., 2001). These oximeters provide accurate readings for blood oxygen saturation percentages ranging from 70 to 100 (Nonin Medical Inc., 2007). In order to increase accuracy, we used the mean of four (20 s) separate oximeter readings taken over the course of the two visits.

Results

Main Analyses: The Conflicted Engagement Effect

We conducted targeted regression analyses to determine whether conflicted engagement (low primary control/high secondary control) affected our 3-year measures of everyday physical activity and cardiorespiratory health. Specifically, we used Hayes's (2013) PROCESS macro for SPSS (Model 3) to conduct a priori simple–simple slope analyses that tested the conditional effect of primary control on our outcomes when secondary control was either low (−1 *SD*) or high (+1 *SD*) and health value was held constant at high (score of 2). Holding health value constant at high allowed us to focus on the health effects of conflicted engagement when health was a relevant and important goal. This targeted approach was preferred over a test of the omnibus Primary Control × Secondary Control × Health Value interaction because it is unwarranted and statistically unfounded to require a significant omnibus test when the focal interest is in conditional effects (Maxwell & Delaney, 2004).

To test our hypothesis that high-risk individuals exhibiting conflicted engagement (low primary control/high secondary control) would experience worse health outcomes than their low-risk peers (high primary control/high secondary control), we regressed our outcomes on primary control striving when secondary control was *high* (+1 *SD*). We compared these conflicted engagement effects with those of primary control striving when secondary control was *low* (−1 *SD*). Because we expected primary control striving to affect the health outcomes when secondary control was high (conflicted engagement effect), we employed one-tailed tests to assess the significance of these directional predictions. In contrast, we employed two-tailed tests to determine the health consequences of primary control when secondary control was low because we expected no effect. All analyses controlled for age, gender, income, education, and functional restrictions.

The hypothesized conflicted engagement effect emerged. Primary control striving predicted everyday physical activity when secondary control was high (conflicted engagement effect), $\beta = .33$, $t(94) = 1.82$, $p = .036$, but not when secondary control was low, $\beta = -.05$, $t(94) = -0.27$, $p = .786$. Similarly, primary control striving predicted cardiorespiratory health when secondary control was high (conflicted engagement effect), $\beta = .47$, $t(94) = 2.66$, $p = .005$, but not when secondary control was low, $\beta = .23$, $t(94) = 1.27$, $p = .207$. Consistent with our logic that conflicted engagement should compromise physical activity and cardiorespiratory health, predicted values indicated that older adults with high secondary/low primary control (high risk) engaged in less everyday physical activity (see Figure 1) and experienced lower blood oxygen saturation levels than their high secondary/high primary control peers (low risk; see Table 2 for a summary of predicted values).

Note that, based on recent developments in statistical methodology (Hayes, 2013), we conducted our analyses using a simple–simple slope procedure that allowed us to examine the influence of primary control on our health outcomes at theoretically meaningful levels of secondary control (−1 *SD*, +1 *SD*) and health value (score of 2 = high) while retaining our full sample ($n = 107$). However, using a more traditional approach that involved selecting only older adults who rated health value as high (score = 2) and subsequently testing the simple slopes of primary control at low (−1 *SD*) and high (+1 *SD*) secondary control produced results that were consistent with the main analyses reported despite the reduced sample size ($n = 81$).

Supplemental Mediation Analyses

Our supplemental analyses employed Hayes's (2013) PROCESS macro (Model 12) to determine whether everyday physical activity mediated the effect of conflicted

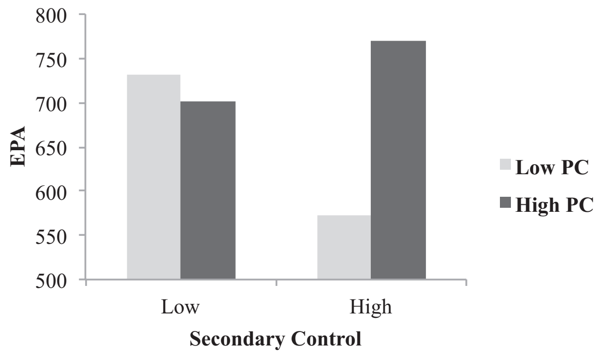

Figure 1. Effects of primary control (PC) striving on 3-year everyday physical activity (EPA) at low and high levels of secondary control.

Table 2. Predicted Values for Conditional Effects of Primary Control Striving

	Low secondary control		High secondary control	
Outcome	Low primary control	High primary control	Low primary control	High primary control
Everyday physical activity	730.77	700.66	572.93[a]	770.22[a]
Cardiorespiratory health	95.12	96.00	93.14[a]	94.96[a]

[a]Simple slope contrast for primary control within specified level of secondary control (low, high) is significant at $p < .05$.

engagement on cardiorespiratory health. Again, all analyses controlled for preexisting differences in age, gender, income, education, and functional restrictions, and health value scores were held constant at high (score of 2). Thus, the indirect effect of conflicted engagement was examined by testing the influence of primary control on cardiorespiratory health through physical activity when secondary control was *high* (+1 *SD*). We compared this indirect conflicted engagement effect with that of primary control striving on health through physical activity when secondary control was *low* (−1 *SD*).

Everyday physical activity reliably predicted cardiorespiratory health beyond the effects of the covariates and independent measures, $\beta = .28$, $t(93) = 2.92$, $p = .005$. Although still significant, the influence of primary control striving on cardiorespiratory health when secondary control was high (conflicted engagement effect) was reduced when accounting for variation in physical activity, $\beta = .38$, $t(93) = 2.18$, $p = .016$; the effect of primary control striving remained nonsignificant at low secondary control, $\beta = -.27$, $t(93) = -1.12$, $p = .265$.

To assess the significance of our hypothesized conditional indirect effects, we used a bootstrap approach that employed 90% bias correct confidence intervals (CIs; Hayes, 2013; Preacher & Hayes, 2008). Mediation was confirmed if zero fell outside the CI based on 5,000 samples of the unstandardized beta weights. Results showed that physical activity reliably mediated the effect of primary control striving on cardiorespiratory health when secondary control was high (conflicted engagement effect), $\beta = .09$ (CIs = 0.0147 to 0.1960), but not when secondary control was low, $\beta = -.01$ (CIs = −0.1074 to 0.0650). Thus, conflicted engagement (high secondary control/low primary control) indirectly compromised cardiorespiratory health, in part, by undermining everyday physical activity.

Discussion

There is growing support for the supposition that older adults who employ complementary goal engagement strategies enjoy health benefits (Wrosch & Schulz, 2008; Wrosch et al., 2007). Less clear, however, are the health consequences of more equivocal forms of goal engagement comprising the use of conflicting control strategies. Consequently, our study focused on the long-term health implications of employing one potentially detrimental combination of health maintenance strategies that promotes motivation-focused thinking but discourages goal-directed behaviors (high secondary/low primary control).

As expected, our results suggest that high-risk individuals employing this conflicting combination of goal engagement strategies (high secondary/low primary control) were more likely to experience physical inactivity and poor cardiorespiratory health relative to their low-risk peers (high secondary/high primary control). Predicted values provide an indication of the magnitude of the effects and show a significant disadvantage for high-risk relative to low-risk adults: Their physical activity was lower by a count of 197.28 (572.93 vs 770.22), and their blood oxygen saturation levels were lower by 1.81% (93.14 vs 94.96).

Previous research on everyday physical activity and blood oxygen saturation enables us to contextualize our findings in relation to arguably the most critical outcome in aging research, mortality. For instance, survival analyses by

Paciocco and colleagues (2001) revealed that each percent decrease in blood oxygen saturation corresponded to a 10% increase in risk of death. Extrapolating to our study, a 1.81% difference in blood oxygen saturation suggests that high-risk individuals (high secondary/low primary control) may be 18% more likely to die than their low-risk peers (high secondary/high primary control). Similarly, Chipperfield (2008) found that each unit decrease in everyday physical activity corresponded to a 1% increase in risk of death (odds ratio = 1.01). By extension, the 197.28 unit difference we found in everyday physical activity suggests that high-risk adults may be nearly twice (197%) as likely to die in comparison to their low-risk counterparts.

Thus, the repercussions of discordant strategy use (conflicted engagement) may be more severe than implied by our results. This incongruous pairing of low primary and high secondary control may indirectly influence future health outcomes of greater consequence (e.g., mortality) through the dependent measures examined in our study. These ramifications highlight the importance of understanding why conflicted engagement undermines physical activity and cardiorespiratory health, exploring adaptive alternatives to this maladaptive state, and ultimately applying this knowledge by developing empirically based interventions designed to promote complementary strategy use among high-risk older adults.

Of note, those experiencing conflicted engagement appear to have behaviorally (low primary control), but not cognitively (high secondary control), disengaged from their health goals. The motivational theory of life-span development proposes that relinquishing a goal requires active disengagement (Heckhausen et al., 2010). However, a simple withdrawal of effort is not sufficient to disengage from a goal, and negative consequences may follow when one does so while remaining cognitively committed (Heckhausen et al., 2010; Wrosch et al., 2003). This contention is supported by our findings. Hence, older adults who have withdrawn effort in pursing their goals may benefit more from an alternative control strategy. Rather than actively sustaining motivation by using selective secondary control strategies, these behaviorally disengaged individuals may benefit from shifting to compensatory secondary control strategies. In contrast to the goal engagement focus of selective secondary control, compensatory secondary control promotes *goal disengagement* by distancing the self from obsolete goals while simultaneously protecting against the negative effects of failing to attain these previously important objectives (Heckhausen, Wrosch, & Fleeson, 2001; Heckhausen et al., 2010).

A growing body of research suggests older adults facing age-related challenges commonly employ compensatory secondary control strategies and that those who do may experience health benefits (e.g., Boerner, Brennan, Horowitz, & Reinhardt, 2010; Chipperfield & Perry, 2006; Schilling et al., 2013). For instance, studies by Chipperfield and colleagues indicate that women, who tend to use compensatory secondary control strategies more frequently than men, are advantaged in terms of fewer hospital admissions and shorter hospital stays (Chipperfield & Perry, 2006; Chipperfield, Perry, Bailis, Ruthig, & Chuchmach, 2007). Further, among older adults with chronic health conditions, compensatory secondary control strategies are related to better 5-year physical health (Hall et al., 2010). Hence, somewhat paradoxically, there appear to be select circumstances under which there are health benefits to actively disengaging from health goals.

However, a viable alternative to goal disengagement is unmitigated goal engagement, comprising a focused investment of selective primary and selective secondary control strategies. Previous research demonstrates that positive pairings of selective primary and selective secondary control advantage adults across the life span, as they predict greater likelihood of goal attainment, higher positive affect, fewer depressive symptoms, fewer chronic conditions, and reduced diurnal cortisol secretion (Haase et al., 2008; Wrosch & Schulz, 2008; Wrosch et al., 2007). Thus, a converging constellation of goal engagement strategies involving intense selective primary and selective secondary control striving may facilitate optimal adaptation for young and old adults alike under most circumstances. However, whether very old adults would be better served by such zealous goal engagement or a more tempered approach involving complete goal disengagement remains unclear and may depend on a variety of factors, including gender or chronicity of condition (Chipperfield & Perry, 2006; Hall et al., 2010). What appears clear, however, is that fully committing to either goal engagement or goal disengagement is more adaptive than maintaining a state characterized by conflicted engagement.

Strengths, Limitations, and Future Directions

Our study has several strengths. First, the motivational theory of life-span development (Heckhausen & Schulz, 1995; Heckhausen et al., 2010) is built on empirical evidence spanning nearly two decades and thus affords a strong theoretical basis to examine the effects of conflicting primary and secondary control strategies. Second, our sample was drawn from the SAS study, which contains data from a representative sample of community-dwelling older adults, enhancing the generalizability of our findings. Third, we had access to objectively measured indices of everyday physical activity and cardiorespiratory health as assessed over a 3-year follow-up among very old adults.

Although there are significant advantages to using the AIM data, this data set also imposes a limitation: Participants in our SAS subsample were very old "survivors" ($M = 83.75$) who outlived their peers. Hence, our findings may differ among young-old (<80) adults who experience fewer functional restrictions. A second limitation is that we did not manipulate the independent measures, and thus, as with all field research, causal inference is never fully warranted. It is possible that the directionality is reversed, such that reduced physical activity and poor cardiorespiratory health precipitate goal pursuit characterized by conflicted engagement. However, our prospective 3-year design provides more compelling evidence that conflicting primary and secondary control striving negatively affect health than would a cross-sectional design.

Several intriguing, yet difficult, questions are raised by our study. For instance, is it ever adaptive to quit actively pursuing (i.e., completely disengage from) health goals? Except in cases of severe functional limitation or terminal illness, it is difficult to conceive of many scenarios in which withdrawing effort and motivational commitment from a goal as consequential as personal health could be beneficial (although see Hall et al., 2010 for an exception). Assuming there are instances in which disengaging from health goals are advantageous, what factors precipitate crossing the engagement–disengagement Rubicon, and at what point is this transition most adaptive? Recent research indicates that crossing the Rubicon may be a gradual process involving an increasing cost–benefit analysis that ultimately instigates goal disengagement after a "tipping point" or action crisis has been reached (Brandstätter & Schüler, 2013). Further, after an action crisis has been reached, older adults may adapt their control striving using a sequential lines-of-defense method (Heckhausen, Wrosch, & Schulz, 2013). Such an approach may involve organized cycles of goal engagement and goal disengagement that facilitate maintaining still viable levels of health while adjusting to intractable declines. In terms of adaptive function, logic and theory (Wrosch et al., 2003) suggest that disengagement may be most beneficial when one has no veridical control over the outcome, and hence the goal is truly unattainable. At that point, pursuing other goals (e.g., emotion regulation) may facilitate and sustain positive emotion (Carstensen, 2006), which is in turn linked to longevity (Ostir, Markides, Black, & Goodwin, 2000). Future research would do well to explore these issues.

Finally, our results have implications for the development of treatment interventions designed for older adults facing age-related declines in health, an especially critical issue for future research due to the unprecedented demographic shift taking place in industrialized nations around the world. For instance, the number of American adults aged 65 and older is projected to double from 2010 to 2050; in fact, roughly 20% of the American population will already be older than 65 years by the year 2030 (Centers for Disease Control and Prevention, 2013). Although people are living longer, increased health problems continue to accompany old age (Hayward & Krause, 2013; Swift et al., 2014) and have significant economic implications: By 2030, health care spending is predicted to increase by 25%, in part due to the fact that a higher proportion of the population will be older (Centers for Disease Control and Prevention, 2013). Hence, some projections suggest there is a dire need to develop empirically validated treatments that promote health and well-being among older adults.

Preliminary research by Gitlin and colleagues suggests control-enhancing interventions may promote better quality of life and even longevity among older adults (Gitlin, Hauck, Winter, Dennis, & Schulz, 2006; Gitlin, Winter, et al., 2006). Older adults who received their primary control focused treatment reported less difficulty with everyday activities, reduced fear of falling, greater self-efficacy, more adaptive control strategy use, and had a lower 14-month mortality risk than their no-treatment peers (Gitlin, Hauck, et al., 2006; Gitlin, Winter, et al., 2006). Given the negative health consequences of conflicted engagement, these encouraging results underline the need for further research on whether control-enhancing interventions are an effective means of promoting harmonious goal engagement among high-risk older adults.

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