Use of Memory Compensation Strategies Is Related to Psychosocial and Health Indicators

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Research has shown that psychosocial and health characteristics may affect older adults’ cognitive performance, self-referent beliefs, and general adaptive resilience. Are such characteristics related specifically to older adults’ reported efforts to compensate for memory losses? The Memory Compensation Questionnaire (MCQ) measures 5 mechanisms of everyday memory compensation as well as 2 general aspects of compensatory motivation and awareness. Correlates were derived from indicators of specific health conditions, subjective health ratings, personality, well-being, and memory self-efficacy (MSE). All measures were administered to a cross-sectional sample of 528 healthy older adults between 55 and 94 years of age from the Victoria Longitudinal Study. Specific health composites (i.e., infirmities, respiratory illness), several personality dimensions (e.g., agreeableness, neuroticism), negative affect, and low MSE were associated with more frequent use of everyday memory compensation strategies. Linking healthy older adults’ cognitive resilience with individual characteristics is an important contribution to emerging conceptions of adaptation and success in late life.

Awareness, beliefs, and complaints about memory are of increasing importance in understanding overall cognitive changes in older adults (Hertzog & Hultsch, 2000). Given that many older adults experience memory failures and believe in memory decline, what can they do to maintain or improve their everyday memory functioning? Memory compensation refers to strategies or processes through which individuals may adapt to, or overcome, decrements or impairments in memory skills. As with other aspects of general resilient or successful aging, variability may exist in everyday memory compensation activities. Older adults may not be equally (a) aware of the challenge of age-related memory changes, (b) committed to maintaining or enhancing memory skills, or (c) successful at selecting and implementing effective compensatory strategies. We have begun to examine the forms of memory compensation (e.g., Dixon & Bäckman, 1995) and the characteristics and frequency of their everyday use (Dixon, de Frias, & Bäckman, 2001). In this article, we explore individual psychosocial and health characteristics that may be associated with older adults’ efforts to compensate for memory losses.

Despite age-associated losses in cognitive reserves—and perhaps corresponding increases in cognitive adversity—compensatory processes may promote resilient or adaptive performance in late life (Freund & Baltes, 1998). Compensatory processes serve to overcome or mitigate losses or deficits through several identifiable mechanisms (Bäckman & Dixon, 1992; Dixon & Bäckman, 1995). These mechanisms include the following: (a) remediation (e.g., investing more time or effort in overcoming a loss), (b) substitution (e.g., developing new, or using latent, skills instead of declining or ineffective ones), (c) accommodation (e.g., adjusting goals and criteria to be more concordant with current demands and one’s skills), and (d) assimilation (e.g., modifying the environmental demands or expectations of others). When implemented, such behaviors may minimize the gap between normal older adults’ capacities and the challenges posed by changing or demanding contextual circumstances. In addition, these mechanisms may be useful for understanding not only cognitive resilience in the face of normal age-associated decrements, but also disease-associated or injury-related deficits.

To date, research on compensatory behaviors and aging have included such domains as the following: (a) maintaining everyday or professional success and competence (e.g., Abraham & Hansson, 1995; Dixon, 1995; Freud & Baltes, 1998), (b) accommodating to personal losses or social decrements (e.g., Brandstädter & Wentura, 1995; Carstensen, Hanson, & Friend, 1995), (c) activating or recruiting new neuroanatomical regions related to task performance (e.g., Dixon & Bäckman, 1999; Reuter-Lorenz, Stanczak, & Miller, 1999), (d) overcoming normal sensory or cognitive deficits in late life (e.g., Bäckman, 1989; Salthouse, 1995; Wahl, Oswald, & Zimprich, 1999), and (e) rehabilitating or adjusting behaviorally to neurological diseases or injuries (e.g., Glisky & Glisky, 1999; Wilson, 1999). Whereas the breadth of such examples underscores the multifaceted application of compensation in aging research, the latter three are particularly pertinent to the present study.

Approaches to research on cognitive compensation have included a variety of experimental, clinical, and verbal-report techniques (Dixon & Bäckman, 1992–93; Wilson, 1999; Wilson & Watson, 1996). Dixon and colleagues (2001) used the Memory Compensation Questionnaire (MCQ) to assess the extent to which five common forms of memory compensation were used by healthy older adults in everyday life. The five compensatory strategies included use of (a) external aids, (b) increased recall-related effort, (c) internal mnemonic techniques, (d) investing extra time, and (e) human collaborative assistance. Overall, the external memory aids
category was most frequently used, followed by the strategies in the order cited herein. Among the 58–85-year-olds in the study, relatively few differences related to age and gender were noted. Notably, older men reported using more strategies involving inanimate external aids and human external support than did younger men, whereas women reported a similar usage of these strategies. Furthermore, the frequency of engaging in all compensatory strategies remained stable over a short-term interval of 3 years. From these initial data it would appear that memory compensation phenomena are definable, measurable, and relatively robust in late life. It is not yet known whether such phenomena are related to other psychological characteristics, some of which may be correlates of cognitive (Bäckman, Small, Wahlin, & Larsson, 2000) and metacognitive (Hertzog & Hultsch, 2000) behaviors, as well as overall adaptive aging (Freund & Baltes, 2002) and personal adjustment (Ryff, Kwan, & Singer, 2001).

In the present study, we explore the extent to which health (objective and subjective) and psychosocial (personality, affect, and memory self-efficacy) variables are associated with self-reported use of the five memory compensation strategies, as well as two memory compensation-related processes, in a new large sample of older adults. Although no research specifically focused on this topic has appeared, several lines of inquiry are informative. For example, health correlates of cognitive performance (e.g., Fahlender et al., 2000; Waldstein, 2000; Zelinski, Crimmins, Reynolds, & Seeman, 1998) and general compensation beliefs (e.g., Freund & Baltes, 1998) have been investigated. A myriad of health factors have been identified as playing a role in memory functioning in late life (see Bäckman et al., 2000; Wahlin, in press). Zelinski and colleagues (1998) used regression models to examine the relative contributions of demographic characteristics and health-related variables in predicting concurrent cognitive performance. After controlling for participant background characteristics (e.g., age and gender), the presence of several health conditions (e.g., stroke, diabetes, depression, and general health ratings) was significantly associated with poorer cognitive performance. Not only objective health conditions (Waldstein, 2000), but also subjective knowledge and beliefs about health have been linked provisionally to cognition in older adults (e.g., Perlmuter & Nyquist, 1990; Wahlin, Maitland, Bäckman, & Dixon, in press). Field, Schae, and Leino (1988) reported that declining subjective health was related to declining performance intelligence scores. Similarly, Wahlin and colleagues (in press) observed a relationship between changing subjective health and changing episodic memory performance. In sum, both objective and subjective health variables have been related to cognitive performance, but not yet to cognitive compensatory behaviors.

Psychosocial variables have been studied more generally in relation to cognitive and metacognitive processes. For example, in a recent study by Shifren, Park, Bennett, and Morrell (1999), poorer cognitive performance in older adults (with rheumatoid arthritis) was linked to poorer mental health (i.e., depression and well-being) and lower general self-efficacy. Psychosocial processes have also been examined in relation to memory (e.g., Cavanaugh & Murphy, 1986) and metamemory (e.g., Ponds & Jolles, 1996). Generally, memory self-efficacy was inversely associated with depression, anxiety, and neuroticism, whereas poorer actual memory performance was related to greater anxiety and depression. Furthermore, van den Heuvel, Smits, Deeg, and Beekman (1996) found that two aspects of personality (i.e., locus of control and neuroticism) served as moderators of the relation between depressive symptomatology and memory impairments. Specifically, among older adults with memory impairments, having an internal locus of control (for women) and low levels of neuroticism (for men) buffered against depression. Personality dispositions (e.g., neuroticism) may be critical determinants of adaptive functioning to the extent that they predispose individuals to plan and implement effective strategies (e.g., coping; David & Suls, 1999). Identifying personality dispositions contributing to adaptive functioning and general compensation in late life would be informative (Freund & Baltes, 1998, 2002; Ryff et al., 2001; Staudinger & Pasupathi, 2000). For example, Freund and Baltes (1998) found that personality characteristics (e.g., extraversion and openness to experience) were positively associated with compensatory behaviors that are supportive of life management strategies. More recently, the same authors (Freund & Baltes, 2002) observed positive correlations between enduring general compensation behaviors, and the same personality dimensions (plus conscientiousness). Overall, psychosocial resources may facilitate the adaptation to actual or perceived losses. Such losses in various domains of daily life may pose a threat to everyday competence (Baltes & Lang, 1997). How well older adults can adapt to losses in such functional domains as memory—how well they may compensate for everyday memory losses—may depend on the availability of a variety of such individual resources and the presence of countervailing adverse conditions.

Aspects of awareness and self-referent beliefs may be associated with compensatory behaviors, just as they are in successful personal coping (Ryff et al., 2001). Metacognitive (and awareness-related) processes serve a crucial role in the extent to which older adults implement compensatory behaviors (Bäckman & Dixon, 1992; Prigatano, 1999). However, providing individuals with mere knowledge of memory aids and their potential cognitive benefits is not sufficient. Also required may be knowledge of which strategies are effective in which conditions, a sense of efficacy about one’s ability to select and implement the appropriate strategy, and perhaps even guided training or sustained practice (Hertzog & Hultsch, 2000; Wilson & Watson, 1996). More general than memory self-efficacy, global self-referent beliefs play a motivating role in one’s commitment to task-related goals (Bandura, 1993). In fact, Ziff, Conrad, and Lachman (1995) found that perceived control was associated with more active involvement in health-promoting behaviors (see also Lachman & Leff, 1989). Having a greater sense of control over cognitive performance may lead to increased effort to identify and apply strategies, thus resulting in potentially improved memory over time (Miller & Lachman, 2000). From this perspective, monitoring memory performance and engaging in compensatory strategies can be seen as one way of “taking control” of one’s remembering capacity. Moreover, the type of compensatory strategy selected may be related...
through control beliefs to age. Specifically, older adults may seek control over memory decline more through external cognitive resources than through demanding internal or effort-intensive cognitive mechanisms (Dixon et al., 2001; Staudinger & Pasupathi, 2000). Overall, aspects of metacognition, personality, and well-being could be associated not only with general coping, compensation, selection, and optimization (Freund & Baltes, 1998, 2002; Staudinger, Mar-siske, & Baltes, 1993), but also more specifically with memory compensation.

No previous research has addressed specifically the extent to which health and psychosocial characteristics are associated with memory compensation in the everyday lives of older adults. This issue is particularly pertinent given links between some health and psychosocial variables and actual memory performance, on the one hand, and general adaptive compensation, on the other hand. Conceivably, engaging in efforts and techniques to compensate for actual or perceived losses may be related to similar characteristics of individual functioning. In this study, we explore the extent to which frequency of self-reported memory compensation techniques are related to concurrent background (age, gender, and education), health (objective and subjective indicators), and psychosocial (personality, affect, and memory self-efficacy) variables. These correlates may serve as a key to identifying important resources that may prolong functional competence and successful cognitive aging.

**METHOD**

**Participants**

We used a sample of community-dwelling adults (initially aged 54–94 years) from the Victoria Longitudinal Study (VLS), a sequential study of factors and processes of adult development. The participants were originally recruited through advertisements in the public media and through appeals to community groups. They were paid nominal fees for their participation. The data used for this study was from the first wave of testing for the second sample (VLS Sample 2), which occurred in 1993. The sample was comprised of 528 participants, including 355 women and 173 men (M age = 68.50 years, SD = 7.61). The average level of education was 14.84 years (SD = 3.13). Further information on this sample is available elsewhere (Dixon, Wahlin, et al., in press). More information on the VLS sampling procedure is available in Hultsch, Hertzog, Dixon, and Small (1998).

**Measures**

**Memory Compensation Questionnaire (MCQ).—**The MCQ is a self-report instrument assessing the variety and extent of means for compensating for memory losses and deficits. Respondents report the frequency with which they engage in functional, adaptive, or strategic memory-related behaviors. Initial questionnaire and item development was conducted in several previous data collections (e.g., Dixon & Bäckman, 1992–93; Dixon et al., 2001). During this phase, a large pool of items was reduced to 44, representing seven a priori dimensions of memory compensation. Previ-ous research with one VLS sample (Dixon et al., 2001) has established good psychometric characteristics of the MCQ. The MCQ contains five scales representing forms of compensatory behavior relevant to everyday memory. A sixth scale represents the level of commitment to success in everyday memory performance, as well as the willingness to accommodate to memory changes. A seventh scale represents the extent to which changes have occurred in each of the forms of compensation and is modeled after the Change scale of the Metamemory in Adulthood instrument (MIA; Dixon, Hultsch, & Hertzog, 1988). The seven scales are described below. Responses for each item are presented on a 5-point Likert scale with higher scores representing more frequent use of the indicated compensatory behavior.

1. **The External scale contains 8 items concerning the use of external memory aids (such as notes, calendars, and bookmarks) for enhancement of everyday memory performance. This scale is similar to one facet of the Strategy scale from the MIA instrument. As a form of memory compensation, the use of external aids has been discussed frequently (e.g., Wilson & Watson, 1996). A sample item reads, “Do you post notes on a board or other prominent place to help you remember things for the future (e.g., meetings or dates)?” Cronbach’s α estimate was .76.

2. **The Internal scale has 10 items focusing on the use of mnemonic strategies (such as imagery and rehearsal) for promoting effective memory performance. The use of mnemonics in aging and neuropsychological settings has been explored by many scholars (e.g., Kliegl & Baltes, 1987; Wilson & Watson, 1996). This scale is similar to one facet of the Strategy scale from the MIA instrument. A sample item reads, “Do you repeat telephone numbers to yourself in order to remember them well?” Cronbach’s α estimate was .80.

3. **The Time scale has 5 items that assess the extent to which the respondent invests more time in performing a valued everyday memory task. Examples include reading passages more slowly and asking people to speak slowly when a goal is to remember the information. A sample item reads, “When you want to remember a story do you read it more than once?” Cronbach’s α estimate was .65.

4. **The Effort scale has 6 items that focus on the investment or application of more effort in performing memory tasks. Examples include concentrating more or trying harder when the goal is to remember an event. A sample item reads, “Do you concentrate a lot to learn something you really want to remember?” Cronbach’s α estimate was .72.

5. **The Success scale has 5 items concerning the extent to which the respondent recruits or uses other people as memory aids, such as asking a friend or spouse to help remember to do something. A sample item reads, “When you want to remember an important appointment do you ask somebody else (e.g., spouse or friend) to remind you?” Cronbach’s α estimate was .82.

6. **The Commit scale includes 5 items designed to reflect the extent to which a respondent is committed to a high level of performance in everyday memory tasks. Commitment to success in memory performance may, when high, reflect a motivation to compensate for deficits and losses. Conversely, a low commitment to success may be reflected in either a relatively low endorsement of compensatory
strategies or in a relaxation of criteria of success (see Dixon & Bäckman, 1995). A sample item reads, “Is it important for you to remember things perfectly (as verbatim as possible)?” Cronbach’s α estimate was .82.

7. The Change scale has 5 items that assess the extent to which the respondent believes changes have occurred over the last 5–10 years in each of the aforementioned six domains. A sample item reads, “Do you use such aids for memory as notebooks or putting things in certain places more or less often today compared to 5–10 years ago?” Cronbach’s α estimate was .75.

Health composites.—In the VLS, participants are asked to examine a list of 26 health conditions and to indicate whether they have experienced them at any time during the previous 2 years. The score values for each health condition item was 0 (no condition), 1 (mild condition), and 2 (moderate condition). Three composites were selected for analysis in this study. These composites and their elements include infirmities (three items: vision, arthritis, and spinal or back trouble), respiratory illness (three items: asthma, bronchitis, and emphysema), and circulatory illness (four items: atherosclerosis, hypertension, heart trouble, and stroke). This three-composite structure was tested empirically using confirmatory factor analysis. Covariance matrices were analyzed using LISREL 8.3. Several indices of model fit were considered in addition to the chi-square test. These indices are the comparative fit index (CFI; Bentler, 1990), the goodness of fit index (GFI; Jöreskog & Sörbom, 1993), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1992; Steiger, 1990). The three-factor model fit the data exceptionally well, χ²(32, N = 512) = 44.78, p > .05, CFI = .95, GFI = .98, RMSEA = .03. The health items loaded significantly onto their respective factors. Each composite was created by summing across the respective items giving the following possible range: infirmities (0–6), respiratory illness (0–6), and circulatory illness (0–8).

Subjective health.—Subjective health was assessed using four individual self-report statements that assess participants’ beliefs about their health. Using a 5-point Likert-type scale, respondents were asked to rate their overall health, eyesight, and hearing as compared with others at the same age, and to rate their overall health as compared with a perfect state. A lower score reflects better subjective health ratings.

Personality.—The 181-item NEO Personality Inventory (Costa & McCrae, 1992) was used to measure the Big Five personality dimensions: neuroticism (48 items), extraversion (48 items), openness to experience (48 items), agreeableness (18 items), and conscientiousness (18 items). Participants indicate the extent to which they agree with each statement using a 5-point Likert-type scale. Previous research with other older adult samples in the VLS (e.g., Small, Hertzog, Hultsch, & Dixon, 2001) has established good structural and psychometric characteristics of the NEO in a comparable sample. Each dimension is measured as a summary score. A higher score denotes greater endorsement of a given disposition. Internal consistency (Cronbach’s alpha) estimates were adequate for neuroticism (α = .93), extraversion (α = .86), openness to experience (α = .89), agreeableness (α = .79), and conscientiousness (α = .86).

Well-being.—Psychological well-being was measured by the Bradburn Affect Balance Scale (ABS; Bradburn, 1969). The ABS is a self-report questionnaire with five items measuring positive affect and five items measuring negative affect. Participants were asked whether they had felt various emotions during the past month. Examples of positive emotions include feeling interested and proud, whereas examples of negative emotions include feeling depressed and upset. Previous work on the ABS in the VLS has indicated relatively good psychometric and structural properties with older adults (Maitland, Dixon, Hultsch, & Hertzog, 2001). The items for positive and negative affect, respectively, are summed (with scores ranging from 0–5) and averaged across each individual. A higher score means endorsing more positive or negative affect, respectively. Internal consistency (Cronbach’s alpha) estimates for positive and negative affect were .59 and .65, respectively.

Memory Self-Efficacy (MSE).—A composite score of three subscales from the Metamemory in Adulthood (MIA) instrument was used to assess participants’ beliefs about their memory as reported in Dixon et al. (1988). These subscales were the following: (a) Capacity (17 items), which assesses perceptions of one’s memory capacities using predictive reports of performance on various tasks; (b) Change (18 items), which reflects perceptions of one’s memory abilities as being stable or undergoing long-term decline; and (c) Locus (9 items), which queries about one’s perceived control over memory abilities. Previous research with large samples indicated that internal consistency using Cronbach’s alpha for Capacity, Change, and Locus was .84, .91, and .75, respectively (Hultsch, Hertzog, Dixon, & Davidson, 1988). Two-year test–retest reliability estimates for Capacity (r = .81), Change (r = .77), and Locus (r = .60) were moderate to high (McDonald-Miszczak, Hertzog, & Hultsch, 1995). Previous research (see Hertzog, Hultsch, & Dixon, 1989) reported substantial convergent validity (r = .87) between the MIA-MSE factor and an MSE factor from the Memory Functioning Questionnaire (Gilewski, Zelinski, & Schaie, 1990). Intercorrelation correlations are moderate to high: (a) Capacity and Change, r = .54; (b) Locus and Change, r = .45; and (c) Locus and Capacity, r = .37. Internal consistency (Cronbach’s alpha) estimates for Capacity, Change, and Locus was .83, .91, and .81, respectively. Correlations among all variables are provided in Table 1.

Procedure
For the larger VLS, each wave of testing includes four testing sessions (two group and two individual) with a variety of tasks administered. In the group sessions, small groups of 2 to 10 individuals were tested together. At each wave, the MCQ is administered in the first of these 2-hr sessions. Paper-and-pencil tasks (which include all tasks in this study) were administered during the first two sessions. The same order of test administration was provided for all participants. Further information on the testing procedure of the VLS is available in Hultsch and colleagues (1998).
Table 1. Correlations Among Memory Compensation Scales Scores and Correlates

| Scale                  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  |
|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. MCQ External        | —   | .41*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2. MCQ Internal        | .42*| .56*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3. MCQ Time            | .14*| .26*| .28*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4. MCQ Reliance        | .20*| .38*| .33*| .15*| .46*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5. MCQ Effort          | .24*| .26*| .27*| .34*| .33*| .25*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 6. MCQ Success         | .06 | .01 | .04 | .07 | .04 | .16*| .14*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 7. MCQ Change          | .28 | .25*| .11*| .03 | .01 | .05 | .11*| .13*| .08 | .12*| .17*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 8. Age                 | —   | —   | —   | —   | —   | —   | —   | .06 | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |
| 9. Gender              | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |
| 10. Education          | .11*| .01 | .05 | .05 | .11*| .13*| .08 | .12*| .17*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 11. Infirmities        | .11*| .10*| .13*| .04 | .13*| .09*| .25*| .13*| .20*| .09*| —   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 12. Respiratory illness| —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 13. Circulatory illness| —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| Relative to perfect state |    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| to others at same age  | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |
| 15. Subjective health:|      | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| Relative to perfect state |    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 17. Subjective hearing | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 18. Conscientiousness  | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 19. Agreeableness      | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 22. Openness to experience |    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 23. Positive affect    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 24. Negative affect    | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |
| 25. MSE                | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   | —   |      |

Notes: N = 475. MCQ = Memory Compensation Questionnaire.

*p < .05.
**Data Analyses**

Following previous research in parallel domains (e.g., Fahlander et al., 2000; Wahlin, in press; Zelinski et al., 1998), a series of concurrent hierarchical regression analyses was conducted separately for each of the seven MCQ scales. The purpose was to examine the independent and relative contributions of five variable clusters to self-reported use of the five memory compensation strategies and the two general MCQ scales. One cluster of covariates (age, gender, and education) was included as the first block. As the influence of these variables was explored in a previous study (Dixon et al., 2001), they were entered first to provide a relatively conservative estimate of the remaining variance of memory compensation accounted for by the operations of the psychosocial and health variables of interest. The clusters of principal correlates were the following: (a) three objective health condition composites, (b) four subjective health ratings, (c) five personality measures, (d) psychological well-being (positive and negative affect), and (e) MSE. After the background variables (in Block 1), the following order was obtained: health condition composites (Block 2), subjective health ratings (Block 3), NEO personality dimensions (Block 4), ABS well-being (Block 5), and MSE (Block 6).

Specific considerations guided some decisions about order of entry. Objective health conditions, rough indicators of biological aging (Anstey & Smith, 1999), were entered prior to subjective health ratings, which may reflect not only veridical health information but also personal dispositions, beliefs, and evaluations (Wahlin et al., in press; Watson & Pennebaker, 1989). Personality traits, reflecting enduring dispositions to experience affect, were entered prior to state-like well-being measures, which appear to be more conceptually associated with both general compensation and successful aging (Freund & Baltes, 1998; Schmutte & Ryff, 1997) and everyday memory compensation. Finally, memory self-efficacy was entered last because it shares conceptual characteristics and method variance with the MCQ.

As for previous and exploratory work in this area (e.g., Fahlander et al., 2000), alpha levels of \( p < 0.05 \) were specified for all analyses. Results are discussed for those models with a significant change in \( R^2 \).

**RESULTS**

After completing the analyses as described above, we tested several alternative but plausible orders of entry. These alternative orders included (a) entering MSE in the block immediately after the background variables, (b) entering subjective health prior to objective health condition, (c) re-
versing the order of the personality and well-being blocks, and (d) entering well-being before subjective health (Watson & Pennebaker, 1989; Zelinski et al., 1998). These alternative orders had virtually no effect in altering model and predictor significance. Therefore, we report only the significant findings for the initial a priori order as specified previously. Results for all analyses are reported in Table 2.

Background Variables
Increased age was associated with a higher commitment to memory success and the view that there has been more recent use of compensatory strategies. Gender was a significant predictor: Women reported more frequent use of external and internal strategies, and greater effort in remembering, whereas men more frequently relied on other people as memory aids. More years of education was related to less frequent reliance on others and to having a lower commitment to memory success. The demographic characteristics accounted for between 2% and 9% of the variance in strategy use.

Health Composites
The infirmities and respiratory illness composites were significant predictors of memory compensation, accounting for an additional 2% to 5% of the variance, after controlling for the background variables. Having lower scores on the respiratory illness composite was correlated with more frequent application of effort in daily memory tasks. Higher scores on the infirmities composite was related to investing both more time and more effort in executing such tasks. Moreover, having a higher score on the infirmities composite was associated with reporting increased use of compensatory strategies.

Subjective Health
The subjective health indicators did not account for any additional variance in MCQ after controlling for background variables and objective health conditions.

Personality
All personality scales were significant positive predictors of at least one MCQ scale, accounting for an additional 3% to 12% of the variance. More specifically, higher conscientiousness was related to greater use of external and internal strategies, applying more effort in memory tasks, and having a higher commitment to success. Notably, agreeableness and neuroticism were significant positive predictors of all MCQ scales. The two remaining personality traits were related to a single MCQ scale. Higher extraversion was associated with exerting more effort in remembering. Openness to experience was inversely related to reliance, indicating that individuals who are more open to experience rely less on other people for everyday assistance.

Well-Being
Positive affect was not significantly related to any MCQ scales. However, negative affect was related to using more external aids and to a lower commitment to memory tasks, accounting for an additional 1% to 3% of the variance.

MSE
Lower MSE was associated with more frequent use of external aids including using other people for assistance, allotting more time and applying more effort toward memory tasks, and increased use of compensatory strategies. MSE accounted for an additional 1% to 17% of the variance.

Discussion
Health and psychosocial characteristics have been related to older adults’ cognitive performance, metacognitive beliefs, and general resilience or aging-related success. We examined whether such characteristics were related to indicators of cognitive resilience and, in particular, memory compensation. The MCQ was designed to assess the extent to which adults compensate for everyday memory losses and deficits. In general, select health conditions, psychological well-being, personality dispositions, and self-referent beliefs about memory were indeed related coherently to some MCQ scales.

Available evidence suggests that participant background characteristics (e.g., age, gender, and education) influence both memory performance (Bäckman et al., 2000; Hultsch et al., 1998; Zelinski et al., 1998) and reported compensatory behaviors (Dixon et al., 2001; Freund & Baltes, 1998). Although our present purpose was mainly to control for these background characteristics before examining other novel relations, two of the results merit specific attention. First, being older was related to greater commitment to performance on memory tasks (i.e., MCQ Success) and a reported increase in use of compensatory strategies in recent years (i.e., MCQ Change). Notably, these age effects replicate the results observed with a different sample (cohort) from the same population. For generally healthy older adults—volunteers for the first wave of a longitudinal study—getting older may be associated with these important indicators of memory resilience. Put simply, such adults recognize the cognitive challenges of aging and attempt to compensate for them. Second, men reported relying more on other people as memory aids than did women. That older men preferred this less taxing, yet effective, cognitive strategy may reflect their more vulnerable cognitive status in late life (Bäckman et al., 2000). The items of the MCQ reflect largely everyday episodic memory challenges; recent evidence has shown that women of all ages perform typically better at such tasks then do men (Herlitz, Nilsson, & Bäckman, 1997), and these differences are maintained across longitudinal intervals (Small, Dixon, Hultsch, & Hertzog, 1999). In addition, this finding of more use of collaborative opportunities may reflect the notion that human aids (especially a spouse) are more readily available as potential resources for older men (Dixon & Gould, 1998).

There is evidence that selected health conditions negatively affect cognitive functioning in old age, even after controlling for demographic factors (Bäckman et al., 2000; Waldstein, 2000; Zelinski et al., 1998). We examined whether health conditions differentiated among adults in terms of frequency of implementation of memory-assisting compensatory strategies. The respiratory illness composite was related to applying less effort in daily memory activities. The presence of such a chronic physical health constraint may demand unremitting attention and place constraints on...
everyday activities, thereby leaving fewer resources to support performance in such effort-demanding and relatively peripheral domains as memory. Conceivably, a central health condition may constrain memory compensation in a way that is parallel to the phenomenon of older adults allocating greater resources to sensorimotor maintenance than to memory functioning (Li, Lindenberger, Freund, & Baltes, 2001). On the other hand, the presence of infirmities was related to investing greater time and effort in memory activities and to relying more on others for memory assistance. The infirmities index includes less chronic or more remediable conditions (e.g., vision). For everyday memory demands, these common infirmities may constitute less formidable constraints on compensatory resources. Nevertheless, such infirmities are predictive of functional decline (Deeg, Kardaun, & Fozard, 1996; Shifren et al., 1999), so it is logical (and adaptive) that affected adults would select strategies that involve the investment of more time and effort to promote successful execution of daily memory tasks. Given the presence of infirmities, managing both the temporal and effort dimensions of memory task performance are adaptive ways of controlling everyday memory demands.

Unlike objective health, subjective self-ratings of health were unrelated to any indicators of memory compensation. Freund and Baltes (1998) observed similarly nonsignificant concurrent correlations between subjective health and general compensation. Considering the recently reported small but significant correlations between subjective health and actual memory performance (Wahlin et al., in press; Zelinski et al., 1998), memory compensation may be, in this respect, conceptually more similar to general compensation than to actual memory. However, we should note that Wahlin and colleagues (in press) actually found no significant concurrent relationship between subjective health measures and memory performance: instead, changes in subjective health correlated with changes in memory performance. Moreover, few studies have examined the influence of subjective health after removing variance associated with health conditions. Given the work of Wahlin and colleagues (in press), one remaining avenue of future research is to examine whether changes in subjective health ratings are related to actual changes in memory (and general) compensatory efforts.

After removing the variance associated with various health indicators, a block of five personality traits was entered in the regressions. Recent research found small but significant correlations between three personality traits (extraversion, openness, and conscientiousness) and general compensation (Freund & Baltes, 2002). In contrast, we observed that extraversion and openness were inconsistent and weak correlates of the five clusters of memory compensation strategies. However, conscientiousness (e.g., being dutiful and achievement striving), agreeableness (e.g., being cooperative), and neuroticism (e.g., showing anxiety and vulnerability) were robustly related to reported use of these strategies. More specifically, high conscientiousness was related to greater use of external and internal strategies, applying more effort in remembering, and setting higher goal commitments (see also Freund & Baltes, 2002). A profile of a conscientious disposition includes the following characteristics: showing competence, self-discipline, achievement striving (as represented by MCQ Success), dutifulness, and goal planning (McCrae & John, 1992). This profile is concordant with the disposition of taking control of one’s ability to remember everyday information by actively engaging in planful goals in order to overcome memory-related deficits. Other research indicates that conscientiousness is also related to using more problem-focused coping strategies (Hooker, Frazier, & Monahan, 1994), such as those reflected in specific compensation strategies (scales) in the MCQ.

Notably, both agreeableness and neuroticism were consistent correlates of all MCQ scales, and they were not significant correlates of general compensation in an earlier study (Freund & Baltes, 2002). Thus, general compensation and memory compensation—although sharing obvious conceptual features—have empirically differentiable predictors, even from the realm of personality. The basis of the neuroticism/memory compensation link may be as follows. Neuroticism has been linked to more frequent memory complaints in older adults (e.g., Ponds & Jolles, 1996), so it is not surprising—and is perhaps reassuring—that it is also associated with engaging in more reported use of memory compensation strategies. Among the present healthy older adults, having a memory complaint and possessing some degree of neuroticism may help to generate a broad range of potentially adaptive compensatory behaviors. Indeed, other research has found relations among neuroticism and total number of coping strategies used (David & Suls, 1999) and indexes of general selection, optimization, and compensation (Freund & Baltes, 1998). Why would agreeableness be a correlate of reported memory compensation use? Perhaps compliant individuals may be more likely to accept formal and informal rehabilitative training and to engage in self-initiated use of strategies to offset a deficit. Indeed, related research has found an association between agreeableness and use of effective life strategies, such as support seeking, positive reappraisal, active coping, and planning (Watson & Hubbard, 1996). Feeling preoccupied, anxious, and depressed about one’s level of functioning in tandem with being relatively high on agreeableness may be a combination that is strongly related to everyday efforts to compensate for memory deficits or declines.

Some personality dispositions can contribute to adaptive functioning in late life (Freund & Baltes, 1998, 2002; Staudinger & Pasupathi, 2000). Accordingly, modifying or optimizing selected aspects of one’s personality (Heatherton & Nichols, 1994) may be advantageous with accumulating aging-related limitations in cognitive reserve potential. Perhaps techniques could be designed to assist older adults in monitoring and encouraging personality characteristics that make an individual more likely to be aware of a memory deficit and to attempt to do something about it or to follow a rehabilitation regimen (Wilson & Watson, 1996). Successful cognitive aging may be linked to a network of influences in overall resilience (see also Ryff et al., 2001). In fact, researchers have observed that personality dispositions may serve a mediating effect between age and indicators of self-related resilience (e.g., adopting compensatory efforts; Staudinger & Pasupathi, 2000). Unfortunately, such a mediational model could not be tested in the present study, as no significant age–compensation relations were observed.

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addition, although there were significant age effects in the MCQ Success and Change scales, personality was not a significant mediator. Other research reveals age differences in general compensation; for example, older adults prefer accommodative (goal-flexible), overassimilative (goal-persistent), compensatory processes in everyday life (Brandstätter & Renner, 1990). Flexibility in goals and investments is facilitated by having available a pool of self-defining concepts from which to select (Staudinger & Pasupathi, 2000). The present study identified several personality dispositions that successfully relate to adaptive memory functioning. Perhaps a profile of personality dispositions (e.g., conscientiousness, flexibility, agreeableness) may facilitate cognitive resilience by (a) alerting one early to memory-related problems, (b) making memory-related goals a priority, and (c) marshaling efforts to overcome and compensate for memory losses, particularly in the face of growing health constraints and losses associated with biological aging. Although this profile may arguably lead to early or sustained efforts to compensate, it is not yet known the extent to which comprehensive compensatory efforts or more task- and domain-specific efforts might be selected and enacted.

Psychological well-being and self-referent beliefs are among the other person-centered resources that can serve proactive or adaptive functions despite the stresses of age-related losses in reserves (Ryff, 1995; Ryff et al., 2001; Staudinger & Pasupathi, 2000). In this study, after removing the variance associated with health and personality traits, we explored whether indicators from these two domains of potential resources were related to use of memory compensation strategies. First, regarding our indicators of well-being, we observed no significant relationship between positive affect and memory compensation reports. Given both the expectation that (more state-like) positive affect could be related to cognitive resilience (e.g., Freund & Baltes, 1998), and the robust correlation of MCQ scales with select personality dispositions (e.g., agreeableness), we conducted a post hoc analysis in which we entered well-being prior to the personality dispositions. With only one significant association (e.g., MCQ Success), we conclude that positive affect was not a correlated "resource" for memory compensation. In this way, memory compensation may differ from general compensation (Freund & Baltes, 1998). Nevertheless, it is still possible that positive affect may be related to memory compensation efforts, but that this relationship occurs only in the presence of greater perceived memory adversity (Ryff et al., 2001) than is the case for this sample. Future research could explore this possibility with memory-impaired older adults.

Interestingly, the original results suggested that possessing higher negative affect was related to endorsing a lower commitment to success in memory tasks. Feeling relatively preoccupied with negative emotions can lead to concentration difficulties and reduced energy for investing in activities requiring sustained concentration (e.g., memory operations). From this perspective, negative affect may reduce the likelihood of engaging in proactive behaviors as reflected in lower commitment to memory success. An alternative interpretation is that negative affect may be associated with a rescaling (downward) of older adults’ goals or standards of success in everyday memory tasks. Although such rescaling of the criterion of success can be an effective strategy for successfully aging adults (e.g., Dixon & Bäckman, 1995), that the present correlate is negative affect is not a condition favorable to this interpretation. Finally, we should note the caveat familiar to researchers in well-being and aging (e.g., Maitland et al., 2001; Ryff, 1995): Low variability in positive and negative affect responses was observed in this sample. In fact, a relatively skewed distribution (toward positive affect) was observed.

The second potential resource for cognitive resilience—metacognitive processes—played a role in the extent to which individuals reported using memory compensation strategies. We found that older adults with higher memory self-efficacy beliefs (a) reported using fewer memory compensation strategies during the preceding 5–10-year period (i.e., MCQ Change) and (b) were less likely (than those with lower MSE beliefs) to report using most of the memory compensation strategies. On the surface, the negative correlations between MSE and MCQ may seem counterintuitive. A closer inspection of the correlational pattern leads to a tentative interpretation. The highest association (r = −.48) is between MSE and MCQ Change; the negative direction indicates that older adults with higher MSE believed that their actual efforts to use memory compensation strategies (and presumably their memory skills) had changed least in the preceding 5–10-year period. That is, they endorsed a stability model for their own memory change, one that is actually consistent with empirical results showing modest 6-year episodic memory change for a parallel VLS sample (Small et al., 1999). If healthy older adults believe their memory is changing only marginally, and if they have a relatively high MSE, there is little need to enact memory compensation strategies. However, conclusions about these data are qualified by the fact that the MSE scale shares method variance with select MCQ scales—a common occurrence in this and allied literatures (e.g., Ryff et al., 2001). As a result, the partial item–content overlap between the two scales could contribute to this relatively high correlation between MSE and MCQ Change.

Several further caveats and future directions should be mentioned. First, this large VLS sample is generally healthy and well educated. It is important to investigate psychosocial correlates and reported use of memory compensation in both (a) clinical or memory-impaired samples, and (b) middle-aged or very old samples (e.g., Dawson, Winocur, & Moscovitch, 1999; Dixon, Hopp, Cohen, de Frias, & Bäckman, in press; Wilson, 1999). Second, future research focusing on whether compensatory efforts are actually effective in countering aging-related memory losses is warranted, as this cannot be determined from the present data. Although the strategies represented in the MCQ are known to enhance everyday memory performance, specific linkages with these scales have not yet been observed empirically. Third, there may be other individual characteristics related to everyday memory compensation. These may range from biohealth to the sociocultural domains and their possible interaction. Whereas the latter domain may include social support networks that may provide an opportunity for resource expansion in old age, its efficiency may be limited by the increasing biohealth constraints in late life (Baltes, 1997). Identifying
characteristics of older adults who spontaneously use compensatory techniques in response to aging-related memory changes may have important theoretical and rehabilitative implications (Wilson, 1999; Wilson & Watson, 1996). Fourth, the present results suggest the intriguing possibility that memory compensation may participate in the larger conceptual space currently identified with such related rubrics as cognitive resilience or psychological compensation (e.g., Dixon & Bäckman, 1995), resilient or successful aging (e.g., Ryff et al., 2001; Staudinger & Pasupathi, 2000), and selection optimization and compensation (Freund & Baltes, 1998, 2002). Further conceptual and (new) empirical work linking these domains may prove especially fruitful.

In conclusion, we found evidence that selected health and psychosocial variables were significantly related to multiple dimensions of cognitive resilience in late life. Specifically, memory compensation—the identification and implementation of compensatory mechanisms in memory-demanding situations—is associated with select characteristics of one’s personality, health, and expectancy beliefs. One benefit of identifying individual difference variables related to memory compensation is that person-level resources (e.g., personality dispositions) may facilitate (or constrain) cognitive resilience and overall successful aging (Baltes & Lang, 1997; Ryff et al., 2001). A long-term implication may be that memory compensation programs could be designed to optimize the fit between healthy older adults and their daily memory demands, just as such programs are effective at doing for memory-impaired older adults.

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