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Memory Complaints in Adulthood and Old Age

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INTRODUCTION

A main question regarding aging and memory complaints is whether they derive from manifestations of actual memory problems, from unfounded beliefs and fears, or from both. Two broad conclusions are supported by the evidence. First, although performance on episodic memory tasks typically declines with age, memory complaints are more reliably correlated with depressive affect and neuroticism than with performance on standardized tests of episodic memory. Second, older adults often but not always voice more memory complaints and concerns than younger and middle-aged adults. What is less clear at present are the processes that generate complaints and whether memory complaints can predict older adults' concurrent or future cognitive status.

The preceding statement may seem quite surprising to clinical neuropsychologists working with older adults. Historically, stated concerns and complaints about one's own memory function have been treated as a diagnostic criterion for Age-Associated Memory Impairment (AAMI: Crook, Bartus, Ferris, & Whitehouse, 1986), cognitive impairment – no dementia (CIND: Plassman et al., 2008), or Mild Cognitive Impairment (MCI: Petersen, Smith, Waring, Ivnik, Tangalos, & Kokmen, 1999; Winblad, et al., 2004). Should subjective memory complaints be part of the diagnostic criteria for age-related memory problems? In this chapter we selectively review the literature on subjective memory complaints and related constructs, such as memory self-efficacy, in adulthood. Where appropriate, we offer conclusions about gaps in the evidence and knowledge about subjective memory and sketch important areas of future inquiry that could advance the field.

DEFINING AND MEASURING MEMORY COMPLAINTS

Three big issues in making sense of the memory complaint literature are (1) how memory complaint is conceptualized and defined, (2) who is being examined, and (3) how memory complaint is measured.

The construct of memory complaints

The concept of memory complaint reflects how individuals present themselves in clinical settings. Memory complaints are

self-reports of problems in remembering desired information in everyday life (e.g., Holsinger, Deveau, Boustani, & Williams, 2007; Kaszniak, 1990; Mascherek, Zimprich, Rupprecht, & Lang, 2011), including concerns about possible deterioration to dementia (e.g., Snitz et al., 2008; Corner & Bond, 2004). A critical question is why individuals do or do not report concerns about everyday memory failures to healthcare professionals.

Actual memory problems are only one influence on complaints. Individuals vary in their proclivity for seeking healthcare services for any symptom (Ramakers, Visser, Bittermann, Ponds, van Boxtel, & Verhey, 2009; Scott & Walter, 2010), including perceived memory problems (Hurt, Burns, Brown, & Barrowclough, 2012). Memory failures may have to reach some kind of critical threshold of functional impairment before individuals seek treatment. Moreover, variables such as loneliness, subjective beliefs about symptoms and illness, and having had a family member with dementia also influence help-seeking behavior (Hurt et al., 2012).

An alternative conception of memory complaints focuses on subjective awareness or perceptions of memory problems. Memory impairment is often accompanied by a lack of awareness of the deficits (anosagnosia; see McGlynn & Schacter, 1989). Brain injury, disease, or trauma that damages the prefrontal cortex can create deficits in the ability to accurately monitor memory failures and to control memory processes (e.g., retrieval searches; Pannu & Kaszniak, 2005). Such deficits may constrain the accuracy of memory complaints in certain patient populations.

Memory complaints can also be viewed as an aspect of beliefs about one's own memory functioning and ability (Gilewski & Zelinski, 1986; Hertzog & Hultsch, 2000). Perceived memory problems can be seen as a negatively framed, failure-oriented aspect of the broader construct of memory self-concept or memory self-efficacy (e.g., Bandura, 1997; Cavanaugh, 2000; Hertzog, Hultsch, & Dixon, 1989; Berry & West, 1993). More generally, one can view subjective memory as part of a larger, interrelated complex of constructs involving representations of aging and memory for oneself and others, which includes stereotypes and beliefs about memory growth and decline across the lifespan (e.g., Lineweaver & Hertzog, 1998; Ryan & Kwong See, 1993), retrospective perceptions of personal memory change (McFarland, Ross, & Giltrow, 1992), and expectations of future memory problems (Lineweaver & Hertzog, 1998). For instance, individuals with a family history of Alzheimer's disease (AD) often manifest anxiety and concern about possible future memory loss and are prone to interpret everyday memory failures as signifying onset of the disease (e.g., Cutler & Hodgson, 1996; La Rue, Small, McPherson, & Komo, 1996).

Who manifests memory complaints?

Much of the work on memory complaints has focused on adult patient populations suffering from diseases or trauma to the central nervous system that affect memory, such as AD, epilepsy, and multiple sclerosis. An important question in differential diagnosis is whether complaints are actually indicative of other mental health issues, such as clinical depression (Niederehe & Yoder, 1989) or anxiety (Elfgren, Gustafson, Vestberg, & Passant, 2010). In research on adult development and aging, the problem of convenience sampling versus representative sampling is often an issue (e.g., Camp, West, & Poon, 1989), especially if the methods of recruiting participants include explicit solicitation of volunteers to participate in studies of memory or memory problems (Schleser, West, & Boatwright, 1986). Memory complaints may affect volunteering behavior in complex ways that may alter the profile of relationships of complaints to other variables, such as neuroticism.

Early studies of memory complaints were primarily focused on populations in the

United States and the United Kingdom. In the last 20 years, however, the study of memory complaints has spread across the globe. Our review of the literature suggests relatively few differences in the manifestations and patterns of memory complaints across population subgroups (e.g., Sims et al., 2011) or countries (but see Cavallini et al., 2013, and Levy & Langer, 1994, for interesting differences in memory beliefs in other cultures). Hence, we make broad generalizations here about aging and memory complaints without explicit consideration of political, racial, or cultural differences.

Measurement of memory complaints

Measures of memory complaint vary widely in scope and content. National surveys like the Health and Retirement Survey (HRS) have used single-item rating scales to evaluate subjective memory concerns (e.g., Herzog & Rodgers, 1989). Other measures focus more generally on everyday cognitive problems, such as the Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, FitzGerald, & Parkes, 1982). The CFQ contains a subset of items that assess everyday memory complaints (e.g., Rast, Zimprich, van Boxtel, & Jolles, 2009).

The Memory Functioning Questionnaire (MFQ; Gilewski, Zelinski, & Schaie, 1990) is perhaps the most widely used memory complaints questionnaire that focuses exclusively on memory. It contains a single item about general memory problems but also assesses reported frequency of forgetting in multiple aspects of memory (e.g., names, appointments) over the previous one-week period. The MFQ also specifically assesses problems in remembering information from texts, perceived change in memory function, and the perceived seriousness of memory problems. The Memory Assessment Clinics – Self-Rating Scale (MAC-S; Crook & Larrabee, 1990) and the Memory Assessment Clinics – Memory Complaint Questionnaire (MAC-Q; Crook, Feher, & Larrabee, 1992) are also widely used. The MAC-S assesses perceived memory ability and frequency of forgetting in a variety of situations, along with four questions about global memory functioning. The MAC-Q measures subjective age-related memory decline.

Finally, more broad-spectrum memory beliefs questionnaires assess subjective memory as part of a larger set of constructs, including perceived control over memory, anxiety about memory, achievement motivation regarding memory, and use of internal and external strategies to support everyday memory (Dixon & Hultsch, 1983; Lachman, Bandura, Weaver, & Elliott, 1995; Lineweaver & Hertzog, 1998).

Cross-sectional findings about memory complaints in adulthood

Important early evidence regarding aging and memory complaints came from large-scale surveys containing a single item assessing memory complaints. Herzog and Rodgers (1989) analyzed data from a representative sample of over 1400 persons with one question about perceived memory problems, rated on a 1 (*inability to recall much information*) to 5 (*no memory difficulties*). Mean ratings were above 4, but age did correlate with rated memory ($r = -.22$). A measure of free recall also weakly correlated ($r = .16$) with self-ratings. Self-rated functional health and gender were the only reliable predictors of self-rated memory with healthy individuals and males rating their memory more positively. Cutler and Grams (1988) also found relationships of age and gender to reported memory problems in a probability sample of almost 15,000 persons ages 55 and older. Again, only self-rated health problems and other limitations on functional independence predicted memory complaints.

Studies using more comprehensive memory questionnaires typically find cross-sectional age differences in subjective memory measures with increasing age associated with

lower ratings of memory ability and greater frequency of memory problems, although the effect size is small (e.g., Lineweaver & Hertzog, 1998; Ponds & Jolles, 1996; Zelinski, Gilewski, & Anthony-Bergstone, 1990). In some studies the age effect on memory complaints is not reliably different from zero, despite adequate statistical power (e.g., Hultsch, Hertzog, & Dixon, 1987).

Likewise, the relationship between questionnaire measures of memory complaints and performance on memory tasks has typically been small in magnitude. Beaudoin and Desrichards (2011) conducted a meta-analysis of correlations between rated memory self-efficacy and measures of episodic memory, finding a mean .15 correlation between them. Although memory complaint scales were excluded from their meta-analysis, it is reasonable to guess that the complaints-memory test correlation has a similar magnitude. Many studies failing to link memory performance and subjective memory may have had insufficient sample size to detect a small effect. Furthermore, latent variable models that correct for random measurement error have typically detected reliable cross-sectional correlations of memory and memory beliefs (e.g., Hertzog, Dixon, & Hultsch, 1990; Hertzog, Dunlosky, & Robinson, 2009; Hertzog, Park, Morrell, & Martin, 2000; Jopp & Hertzog, 2007; Lane & Zelinski, 2003; Zelinski & Gilewski, 2004). Clearly, memory complaints do correlate with memory performance, but with a modest effect size.

What else might prevent a stronger correlation between memory complaints and performance? Unfounded memory concerns could be generated by depressive affect, specifically, or neuroticism, more generally. Early on, Kahn, Zarit, Hilbert, and Niederehe (1975) reported that complaints about memory were related to depressive symptoms but not objective memory performance. Multiple other studies since that time have identified a robust depressive affect – memory complaint link (e.g., Crane, Bogner, Brown, & Gallo, 2007; Hänninen, Reinikainen, Helkala, & Koivisto, 1994; Pond & Jolles, 1996; Verma, Pershad, Kaur, & Bhagat, 1996; Zelinski & Gilewski, 2004). In fact, cross-sectional relationships of memory complaints scales with depression are typically larger in magnitude than the correlations of memory complaints scales with memory performance. There have also been several studies finding that the broader personality construct of neuroticism predicted memory complaints in younger and older adults (Pearman & Storandt, 2004; Pearman, 2009; Verma et al., 1996). Among the multiple facets of neuroticism, only self-consciousness, which is related to self-esteem and embarrassment, reliably predicted memory complaints (Pearman & Storandt, 2005). Perhaps people high in self-consciousness experience memory failures in social settings as particularly distressing, believing that they are being negatively perceived for their memory failures.

Pearman, Gerstorf, and Hertzog (2013) recently evaluated relationships of neuroticism, depressive symptoms (measured by a clinician), and memory task performance to memory complaints in the Berlin Aging Study, which has an atypical rectangular age and gender distribution in persons 70 to 100 years of age and includes many very old adults. Significant relationships of neuroticism, depression symptoms, and subjective age to subjective memory complaints were found, whereas episodic memory measures provided little predictive validity. Such outcomes suggest that depression and neuroticism independently predict memory complaints, even in late older adulthood.

Other aspects of personality and behavioral style may also correlate with memory complaints. Conscientiousness – which taps into personal organization, levels of distractibility, and self-discipline – is negatively related to level of memory complaints in both young and older adults (Pearman, 2009; Pearman & Storandt, 2004; Slavin et al., 2010). Individuals low in conscientiousness may have difficulty with everyday memory

tasks because they are poorly organized and are less likely to engage in proactive compensatory memory strategies (e.g., Dixon, de Frias, & Bäckman, 2001).

Given the pattern of relationships reviewed to this point, one can wonder about the construct validity of memory complaints. One basis for validating memory complaints comes from comparisons of self-reports with informant (often spouses and/or children of older adults) reports. The relationships between self- and informant- rated memory vary and depend on several factors, including patient diagnosis (e.g., non-demented, MCI, demented) and non-cognitive variables, such as depression or anxiety in the informant, and the nature of the relationship between the participant and the informant.

For patients with AD and other dementias, informant reports of memory ability are typically more accurate predictors of neuropsychological test performance than patient reports (Buckley, Norton, Deberard, Welsh-Bohmer, & Tschanz, 2010; Chung & Man, 2009; Jorm, 2004; Loewenstein et al., 2001). Few studies have examined the relationship between informant- and self-report of memory problems in non-demented healthy older adults. Sunderland and colleagues (1986) found that informant reports of memory problems had lower predictive validity for memory test performance than self-reported memory problems in their sample of healthy older adults. Buckley et al. (2010) and Chung and Man (2009) found that in normal control groups, higher self-rated memory ability was negatively related with informant ratings of perceived decline (better memory, less decline). However, for patients with MCI or dementia, self-rated memory was not correlated with informant report, possibly due to their anosagnosia. Recently, Volz-Sidiropoulou and Gauggel (2012) studied memory complaints in healthy older adult couples. Underreporting of memory problems when compared with spousal ratings was significantly related to poor memory performance in men but not women.

Longitudinal findings about memory complaints in adulthood

Early in the process of investigating relationships of memory complaints to memory, Herrmann (1982) noted that one constraint on concurrent relations between the two variables might be between-person variability in the criteria used for rating memory complaints. Individual differences in standards for rating the severity of experienced memory problems could limit the magnitude of the relevant cross-sectional correlations. Herrmann suggested collecting longitudinal data and correlating within-person changes in memory with changes in subjective memory complaints or retrospective ratings of change in memory. People, in effect, could serve as their own baseline for assessing change.

Since that time a number of longitudinal studies have assessed whether individual differences in memory change are correlated with changes in memory complaints. Studies have found that longitudinal changes in memory task performance are associated with both initial levels of memory complaints (e.g., Hohman, Beason-Held, Lamar, & Resnick, 2011) and longitudinal changes in memory complaints (e.g., Lane & Zelinski, 2003; Taylor, Miller, & Tinklenberg, 1992). Actual changes in episodic memory also have reliable but weak relations to retrospective perceptions of changes in memory (Lane & Zelinski, 2003), although these effects can be partly explained by implicit internalized theories of age-related memory decline rather than monitoring of actual memory changes (see McDonald-Miszczak, Hertzog, & Hultsch, 1995).

Two recent papers nicely illustrate the benefits of latent growth curve models for examining concurrent changes in memory performance and memory complaints. Mascherek and Zimprich (2011) used 3-wave longitudinal data from the German Interdisciplinary Study on Adult Development on 297 adults (age range 63 to 74) providing complete 3-occasion data in memory and memory complaints. The disattenuated .23

correlation between complaints and memory performance intercepts (corresponding to a cross-sectional correlation) was significant, albeit smaller, than the .39 correlation of age-change slopes.

Parisi et al. (2011) evaluated 5-year longitudinal data on a sample of over 1400 adults, assessing episodic memory (performance on a combination of word list recall and text paragraph recall) and memory complaints. They estimated a .29 partial correlation (controlling for multiple covariates) of initial complaints (measured by the MFQ Frequency of Forgetting scale) and memory performance, compared with a .44 correlation of longitudinal changes in those two variables.

These studies apparently confirm Herrmann's (1982) conjecture that changes in memory complaints are robustly associated with changes in objective memory performance. However, not all latent variable studies using longitudinal data find reliable prediction of changes in memory complaint by changes in memory, despite adequate statistical power (e.g., Lane & Zelinski, 2003; Pearman, Hertzog, & Gerstorf, 2013), and there are insufficient studies in the literature for a meaningful meta-analysis at present.

Recent developments in memory complaints research

Prospective memory complaints

One area of research in memory complaints that has blossomed over the last ten years concerns complaints about prospective memory – remembering to enact or realize behavioral intentions (e.g., Einstein & McDaniel, Chapter 3, this volume). Research on prospective remembering emphasizes the process of retrieving intentions to remember and acting upon those intentions while possibly monitoring the environment for action cues (e.g., Mäntylä, Rönnlund, & Kliegel, 2010; Smith, 2003).

The Betula Longitudinal Study has evaluated both prospective memory (e.g., Mäntylä & Göran-Nillson, 1997) and subjective prospective memory (Rönnlund, Vestergren, Mäntyla, & Göran-Nilsson, 2011) using the Prospective and Retrospective Memory Questionnaire (PRMQ; Smith, Sala, Lotie, & Maylor, 2000). Rönnlund, Vestergren, Mäntylä, and Göran-Nilsson (2011) found no age differences in the prospective and retrospective PRMQ scales – essentially flat-line functions – from age 60 to age 90. Furthermore, neither PRMQ scale was reliably predicted by objective retrospective or prospective memory, although the measurement of prospective memory was limited to a single binary outcome variable. Rönnlund et al. (2011) did find, however, that depressive symptoms (as measured by the CES-D) and a measure of self-directedness (related to neuroticism and conscientiousness) predicted both PRMQ scales with similar regression weights. Other studies have identified significant but small (.20) correlations of the PRMQ prospective scale with binary prospective memory performance (Kliegel & Jäger, 2006; Mäntylä, 2003) in middle-aged and young-old samples.

Hannon, Adams, Harrington, Fries-Dias, and Gipson (1995) evaluated subjective and objective prospective memory in a sample of persons with closed-head brain injuries and normal adult controls. Prospective memory complaints were measured with a Prospective Memory Questionnaire (PMQ). The brain-injured group reported more prospective memory problems than normal controls. The subjective scales correlated with a short-term prospective memory task; however, they showed even stronger correlations with scores on a depression scale.

Uttl and Kibreab (2011) investigated subjective prospective memory in a sample of 240 undergraduates using multiple measures of laboratory prospective memory and a much broader range of prospective and retrospective memory questionnaires. The PRMQ scales did not correlate reliably with prospective memory variables ($-.10 < r < .00$), while Hannon et al.'s (1995) PMQ scales did correlate reliably with prospective

memory performance, especially a measure requiring individuals to circle target words when encountered within task instructions (all *r*s < −.3). Other newly developed subjective prospective memory scales used by Uttl and Kibreab (2011) also showed some small but significant correlations with prospective memory performance. Like studies of retrospective memory complaints, Uttl and Kibreab (2011) found robust correlations of conscientiousness and neuroticism with measures of subjective prospective memory, with conscientiousness having the larger relationships. Indeed, their hierarchical regression analysis showed that conscientiousness predicted PMQ scale scores independently of retrospective memory performance and neuroticism. They concluded that existing subjective prospective memory scales lack acceptable validity as predictors of prospective memory performance (see also Salthouse, Berish, & Siedlecki, 2004).

Neurobiological correlates of memory complaints

Recent studies have examined relationships between memory complaints and certain neuropathologies, such as white-matter lesions brain atrophy, as well as AD pathology. Not surprisingly, given the inconsistent findings of the other literature on memory complaints, results regarding the neurobiological correlates of memory complaints are also mixed.

White-matter lesions have been shown to be related to age-associated cognitive impairment (Bunce et al., 2010; Gunning-Dixon, Brickman, Cheng, & Alexopoulos, 2009). If memory complaints indeed signal neurodegenerative processes, then older adults with memory complaints should have more white-matter lesions than comparable controls. Minett, Dean, Firbank, English, and O'Brien (2005) found that memory complaints were related to white-matter lesion severity, even when controlling for depression. Similarly, Stewart and colleagues' (2011) longitudinal study found that memory complaints at baseline were related to increases in subcortical white matter lesions over a four-year period.

Memory complaints also correlate with lowered hippocampal-system volume (Jessen et al., 2006; Stewart et al., 2011; van Gunten & Ron, 2004). However, in the van Gunten and Ron study, depression was also related to lower hippocampal volume and the patients did not progress to dementia during follow-up, but did remain depressed. The authors suggested that "the structural brain abnormalities associated with subjective memory impairment may be associated with persistent affective symptoms" (p. 439). However, Van Norden et al. (2008) found that hippocampal volume was related to older adults' objective memory performance and subjective memory, controlling on white-matter lesions and depression.

Risk factors for memory pathology, such as the presence of amyloid plaques, tau tangles are often suggested as predictors of AD presence and/or severity. Barnes, Schneider, Boyle, Bienias, and Bennett (2006) found that level of memory complaints were positively related to the post-mortem presence of both amyloid and tau in older adults with memory complaints. This relationship was partially, but not fully, explained by depression symptoms. However, Antonell et al. (2011) and Schoonenboom et al. (2012) found normal ranges of cerebrospinal fluid AD biomarkers in participants with subjective memory complaints. Amyloid-β (Aβ) deposits in cortex are a better biological marker of probable AD, and recent neuroimaging techniques allow for the non-invasive assays of Aβ in living patients. Perrotin, Mormino, Madison, Hayenga, and Jagust (2012) recently reported that positron emission tomography (PET) targeting Aβ showed differences between individuals with subjective memory complaints and non-complainers, who also differed on an immediate recall test.

Finally, newer studies are beginning to look at functional imaging techniques, such as functional magnetic resonance imaging (fMRI), to evaluate relations of memory

complaints to functional activation during memory tasks. Haley, Eagan, Gonzalez, Biney, and Cooper (2011) examined a working memory task (continuous 2-back discriminations) in a sample of middle-aged individuals at risk for cardiovascular disease. Higher memory complaints were associated with worse performance ($r = -.30$), and complaints correlated with the lower levels of fMRI activation in prefrontal areas often associated with working memory networks. Erk, Spottke, Meisen, Wagner, Walter, and Jessen (2012) also conducted fMRI of episodic and working memory in a subjective memory complaints group (identified by family or spouse reports of memory problems to help avoid contamination by negative affect of the patient). They found greater activation in right hippocampus for control participants over individuals with memory complaints; conversely, they found greater activation in right dorsolateral prefrontal cortex (a region often associated with controlled memory retrieval) in memory complainers. In both cases, degree of activation correlated with recognition memory performance, leading Erk et al. (2012) to conclude that the activation in prefrontal cortex for complainers was functional neural compensation for early preclinical hippocampal dysfunction. Unlike Haley et al. (2011), no differences in brain activation were found in Erk et al.'s working memory task.

Hohman et al. (2011) reported that initial CFQ scores predicted longitudinal decline in performance the California Verbal Learning test (CVLT; a test of multi-trial categorized free recall). They found no initial (cross-sectional) correlations of CFQ with memory. However, the CFQ was reliably associated with structural measures of regional blood flow (as measured by PET) in insula, inferior parietal cortex, and occipital cortex in their cross-sectional sample. CVLT memory scores (but not the CFQ) were associated with activation in prefrontal cortical areas thought to be critical for strategic organization and controlled retrieval on the CVLT (e.g., Alexander, Stuss, & Fansabedian, 2003). Although activation in inferior parietal cortex and occipital regions has been linked to recollection of accurate verbal and perceptual detail during memory tests (e.g., Okada, Vilberg, & Rugg, 2012) and the use of imagery strategies for encoding verbal materials (Leshikar, Hertzog, & Duarte, 2012), it could be the case that the CFQ-correlated regions found by Hohman et al. are associated with non-mnemonic processes that actually suppress cross-sectional CFQ correlations with the CVLT.

Clearly, work on the neurobiological correlates of memory complaints is in its early stages, and there is both insufficient and inconsistent evidence about whether subjective memory complaint is associated with indicators of brain pathology and brain function in older adults. Authors on recent papers using fMRI (e.g., Haley et al., 2011) have argued strongly for the validity of memory complaints based on group differences in brain activation patterns, stating that they have identified brain correlates of early memory change that validate self-reports that are otherwise difficult to corroborate. By this logic, self-reported memory problems by patient or informant could be the initial sign of pending cognitive decline (especially if validated by other measures such as structural indices of hippocampal volume). However, results are heterogeneous across studies, and there is still little consensus in the cognitive neuroscience community about how the networks of brain structures supporting episodic memory actually operate, making it difficult to interpret the various functional imaging outcomes. The argument that structural and functional brain differences between subjectively impaired and normal older adults validate memory complaints as an early warning sign of memory decline are exciting yet premature, but this situation could change rapidly.

Research on memory complaints in geriatric psychiatry

The past ten years of research in the field of geriatric psychiatry has seen a large number

of studies that have essentially rediscovered phenomena already reported in the psychological literature. Specifically, numerous studies report that cross-sectional data reveal low correlations of memory complaints to memory performance and that there are much stronger relationships of memory complaints with depression and other measures of negative affect (e.g., Elfgren et al., 2010; Jorm et al., 2004; Slavin et al., 2010).

However some of this literature has focused more specifically on subjective memory complaints as it relates to MCI and dementia. Some studies have generated evidence that memory complaints may correlate with a transition from normal aging to MCI or from MCI to dementias, such as AD. For instance, Schofield, Jacobs, Marder, Sano, and Stern (1997) examined 80 individuals with no memory complaints at baseline in a longitudinal study. At one-year follow-up, 20 individuals had developed memory complaints. New memory complaints were significantly associated with declines in scores on both visuospatial memory as well as episodic memory. In a similar study, Schmand, Jonker, Geerlings, and Lindeboom (1997) examined 2,114 individuals without apparent dementia. At baseline, depressive affect was the variable most strongly associated with baseline subjective memory complaints. However, the presence of dementia at four-year follow-up was predicted by age, baseline cognition, and memory complaints, which suggests that memory complaints may have some predictive validity in terms of the development of dementia.

These findings highlight one of the aforementioned problems with examining memory complaints in clinical versus nonclinical populations. Although anosagnosia becomes prevalent in the middle to late stages of AD, it can and does also occur at earlier disease stages. To the extent that preclinical dementia is accompanied by changes in the accuracy of objective self-awareness, actual memory declines may not be manifested in memory complaints. This is why it is recommended that memory complaints be corroborated by an informant or collateral source (Loewenstein et al., 2001; Roberts, Clare, & Woods, 2009) in patient populations. The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE; Jorm, Scott, & Jacomb, 1989) is the most commonly used measure used to gather collateral source opinion of cognitive decline in older adults. Studies using the IQCODE generally have found it to have better predictive validity in terms of actual decline than participant self-report (Ayalon, 2011; Farias, Mungas, & Jagust, 2005; Isella, Villa, Russo, Regazzoni, Ferrarese, & Appollonio, 2006; Jorm, 2004). Informant reports tend to be less affected than screening measures such as the MMSE by premorbid intelligence and educational status (Isella et al., 2006; Jorm, 2004). However, as mentioned previously, informant reports can be influenced by noncognitive factors such as mood or anxiety of the participant, the informant, or both (Jorm, 2004; Volz-Sidiropoulou & Gauggel, 2012). Finally, Cacchione and colleagues (2003) found that informants who did not live with the patient or see the patient regularly were significantly less accurate at identifying memory impairment and changes. Regular contact with a person may be required to before informant reports are likely to be helpful in diagnosis.

Explaining the negative affect – memory complaint correlation

The association between neuroticism, depression, and depressive affect with memory complaint is well-established. What is currently needed is more work trying to identify the mechanisms that produce this relationship.

Psychological treatment studies for clinical depressive disorder support the hypothesis that memory complaints are a symptom of depression rather than the reverse. Several studies have found that successful treatment of depression lowers memory complaints (Antikainen et al., 2004; Plotkin, Mintz, &

Jarvik, 1985; Zarit, Gallagher, & Kramer, 1981). For instance, Plotkin et al. (1985) found that the depressed elderly outpatients who responded positively to treatment not only improved in their subjective mood but also decreased their number of memory complaints. Conversely, studies finding training-related improvements in memory and subjective memory typically do not show subsequent changes in depressive affect (Scogin, Storandt, & Lott, 1985; Rasmusson, Rebok, Bylsma, & Brandt, 1999). Although one should be circumspect about issues such as the depth and breadth of memory training studies, the available evidence suggests that depressive affect influences memory complaints, not vice versa.

Exploring the nature of depression in late life may also shed light on its relationship with memory complaint. Cognitive theory, for instance, suggests that people become depressed because of inaccurate, negative biases in their evaluation of themselves and their capabilities (Strunk & Adler, 2009). Negative memory evaluations could be just another form of negative (and inaccurate) self-assessment. Given that memory concerns are highly salient to older adults, memory complaints in older adults with depression should be particularly pronounced, especially when they are questioned about current memory ability. People with depressive symptoms also overestimate the probability of negative future events and show a pessimistic bias (Strunk, Lopez, & DeRubeis, 2006). Consistent with this hypothesis, Crane and colleagues (2007) found that negative cognitive bias, in the form of hopelessness and low self-esteem, fully mediated the relationship between depression and memory complaints.

Similar arguments can be made about neuroticism's relationship with memory complaints. People who are high in neuroticism evaluate their lives with more negativity than people lower in neuroticism and may also be hyperaware of possible memory problems. Kverno (2000) found that people high in neuroticism covertly review threats to themselves, thereby maintaining a negative self-concept. In the context of everyday memory failures, this threat review could actually lead to a better recall of memory failures (e.g., reviewing how an object was lost, or ruminating about where it could be), so that when given a memory questionnaire about ability or frequency of problems, these memory failures would be more readily accessible for a highly neurotic individual than for someone lower in neuroticism.

Construct validity of memory complaints measures

Important questions about the limited predictive validity of memory complaints scales for memory and cognition need to be understood and addressed. As psychologists, we believe it is useful to conceptualize the process by which individuals generate memory complaints (or, more narrowly, responses on memory complaint questionnaire items) and the sources of information accessed and evaluated during that process. A general assumption about memory complaints seems to be that individuals monitor memory successes and failures in everyday life, and then use that monitoring to construct accurate self-representations of their memory problems. How must our conceptions of memory complaints be altered to accommodate the evidence of a limited relationship of memory performance and memory complaints?

Rabbitt, Maylor, McInnes, and Bent (1995) argued that older adults may not report more cognitive lapses than younger adults because of a lower level of environmental demands for memory use in old age. Park et al. (1999) reported that self-reported busyness predicted prospective memory failures in middle age, lending some credence to this argument (but see the failure to replicate by Cuttler & Graf, 2007). Given the difficulties in assessing environmental pressure with respect to memory, Rabbitt et al.'s hypothesis has not yet been adequately tested.

Rabbitt and colleagues also noted that the limited correlations could be an artifact

of creating aggregate memory complaint scales that combine responses across multiple domains of memory (e.g., remembering names, faces, phone numbers, and appointments; see also Rabbitt & Abson, 1990). Summing ratings over multiple memory domains could dilute the validity of domain-specific memory complaints. However, there is at present little evidence to support the claim that aggregation over domains is a major issue in validation of memory complaints. For example, differentiating prospective and retrospective memory in both self-ratings and memory tasks does not improve correlations of ratings and tasks, but such evidence is far from definitive.

Another explanation, traditionally framed as a critique of the ecological validity of memory tests, argues that subjective beliefs about memory arise in the context of everyday uses of memory, but that these aspects of everyday memory are inadequately sampled by standard laboratory memory tasks (e.g., Bruce, 1985; Gruneberg, Morris, & Sykes, 1991; for an alternative perspective, see Chaytor & Schmitter-Edgecombe, 2003). From this point of view, the fault is not in the beliefs, but in the task used to validate them.

The existing data offer some support for this view. For example, West, Crook, and Larrabee (1983) found that correlations of memory complaints measures were higher for tasks with face validity for everyday life (e.g., grocery shopping lists), but the improvement over traditional memory tests was relatively minor. Cuttler, Graf, Pawluski, and Galea (2011) found that prospective memory complaints in pregnant women predicted field prospective memory tests (e.g., phoning the laboratory) but not laboratory prospective memory tests. Witt, Glöckner, and Helmstaedter (2011) found better predictive validity with memory complaints of a memory test with a longer four-week retention interval, suggesting that everyday memory complaints may be about longer-term forgetting. Perhaps the most impressive evidence involves differentiation of recollection and familiarity in memory tests. Debreuil, Adam, Bier, and Gagnon (2007) and Guerdoux, Dressaire, Martin, Adam, and Brouillet (2012) both reported that predictive validity of complaints for memory performance could be enhanced by using process-dissociation procedures in recognition memory tasks to generate better measures of recollection. They argued that recollective failures are more salient in everyday life and hence more likely to influence perceived memory problems.

It does appear that modest gains in validity may be obtained by selecting tasks that align with the types of memory success and failure experiences people encounter. Of course, this is not an easy problem to correct and definitive proof requires better qualitative evidence about the experiential basis for memory complaints. Everyday memory failures are more often prospective than retrospective in nature, and memory successes often require conscientious application of memory-supporting habits, such as the use of external aids (e.g., Cavanaugh, Grady, & Perlmutter, 1983). Vestergren and Nilsson (2011) reported that memory complaints in older adults are attributed to aging, whereas middle-aged adults attribute memory failures to stress and cognitive demands created by multi-tasking. In theory, interview approaches as used in that study could be useful for characterizing the contextual demands that increase risk for memory failures, with possible benefits for improving criterion tasks for memory complaint validation (e.g., measuring event-based prospective memory while under divided attention when prospective cues are presented).

In general, however, definitive tests of the ecological validity explanation for low correlations of memory beliefs with memory performance require better assessment of memory failures as experienced in the natural ecology. There have been efforts towards using virtual environments and simulated complex tasks to better approximate remembering in natural contexts and to foster training of executive control in everyday life (e.g., Levine et al., 2007). It is yet

unknown whether memory complaints will predict memory failures in such task environments. There is tantalizing evidence that subjective reports of attention issues and cognitive failures, as measured by more specific subjective reports of attentional deficits when driving, correlate with driving errors in driving simulators (Wickens, Toplak, & Wiesenthal, 2008).

An alternative perspective on the poor predictive validity of memory complaints focuses on the process by which questionnaire responses are generated. Memory self-ratings can be influenced by internalized implicit theories and stereotypes about age-related memory decline (e.g. Cavanaugh, Feldman, & Hertzog, 1998; McDonald-Miszczak, Hertzog, & Hultsch, 1995). For instance, age differences in self-rated memory ability vary depending upon whether people are asked (1) to rate themselves without an explicit standard of comparison being provided, (2) to rate themselves relative to people of all ages, or (3) to rate themselves relative to people of all ages (Lineweaver & Hertzog, 1998). Age differences in self-rated memory were most likely when ratings were requested relative to persons of all ages and were not reliable when ratings were to one's same-aged peers, and fell in between when no explicit standard was provided. This pattern suggests that consideration of one's age occurs for some individuals absent an explicit age standard.

Individuals may have internalized a self-schema of memory decline that is accessed when the individual is queried about memory problems (Cavanaugh et al., 1998). The negative memory self-schema is also apt to be continually reinforced by an attributional process in which experienced everyday memory failures, common at all ages, are interpreted in the context of concerns about possible age-related memory loss.

An implicit theory account challenges the assumption that reported memory problems are based on accurate monitoring of memory successes and failures in everyday life. In principle, it could be possible to enhance self-report validity with manipulations that discourage memory complaints responses based on self-schemas and encourage access to valid sources of information (such as memories for actual failures and successes when remembering).

The behavioral specificity hypothesis

Consistent with this view, Hertzog, Park, Morrell, and Martin (2000) offered an ecologically based hypothesis about predictive validity of memory complaints termed the behavioral specificity hypothesis. It states that predictive validity will be maximized when reports of memory problems are specifically linked to observable behaviors. The root causes of limited predictive validity are seen as both (1) a property of how questions are framed in typical complaints scales (not specific to actual behaviors) and (2) the criterion variable employed (task performance, rather than actual behaviors).

Hertzog et al. (2000) evaluated the behavioral specificity hypothesis by assessing medication adherence in a cross-sectional sample of rheumatoid arthritis patients. Each participant completed the MFQ, multiple cognitive tasks (including tests of episodic memory and prospective memory), and an interview about medication usage. Subsequent medication adherence was monitored for one month by using microelectronic-chip bottle caps to record the date and time the bottle was opened, the actual behavior of interest.

Another critical feature of the study was the nature of the medication interview. Participants brought all prescription drugs to the interview, answering questions about each one. A critical question, similar to the MFQ Frequency of Forgetting scale items, asked, "How often over the last month did you forget to take this medicine as prescribed?" Medication adherence complaints were scaled as the mean rating of problems across all medications.

Actual medication adherence errors three and four weeks after the interview correlated .35 and .42, respectively, with the reported adherence complaints. However,

this measure did not correlate appreciably with any of the cognitive tasks in the measurement battery, including a prospective memory task. Conversely, the MFQ Frequency of Forgetting scale correlated between .20 and .35 with the different laboratory cognitive measures, but not with actual medication adherence errors. This dissociation was consistent with the behavioral specificity hypothesis. Interview-based adherence complaints predicted only subsequent medication adherence, whereas the MFQ did not.

It is likely, then, that the validation of memory complaints with respect to memory failures in everyday life can be improved by using measures that are designed to create a supportive retrieval context (Fisher, Amador, & Geiselman, 1989) that facilitates access to relevant instances in memory. Regarding memory behaviors, modern technology may help mitigate some of the inherent difficulties in ecological sampling in future studies through techniques such as virtual reality simulations, mobile-phone use for time sampling, and web-based data collection (e.g., Wickens et al., 2008).

Functional effects of negative memory beliefs

An interesting question about memory complaints is whether they have any functional impact on everyday cognition and behavior. As noted earlier, memory complaints do not always lead to seeking treatment for memory problems. Another important issue is whether concerns about memory function lead to compensatory behaviors to maintain memory functioning. Correlations among self-report scales from memory questionnaires support the argument that low perceived memory ability and higher complaints are associated with reports of greater uses of mnemonics and external aids to support everyday remembering (e.g., Hertzog, Hultsch, & Dixon, 1989). Dixon and colleagues developed and validated the Memory Compensation Questionnaire (MCQ) to study multiple aspects of this construct, showing longitudinal age-related increases in compensatory behaviors in midlife and beyond that were related to worse objective memory performance (e.g., Dixon & de Frias, 2007). Apparently they have not explicitly studied the linkage of memory complaints to shifts in these compensatory behaviors. Garrett, Grady, and Hasher (2010) found reliable prediction of MCQ scales by memory complaints in a sample of older adults. Parisi et al. (2011) examined longitudinal changes in the MFQ Strategy scale, finding no connection of level or change in use of external memory aids with objective memory performance. Hence it is still an open question as to whether compensatory memory-related behaviors change in reaction to experienced memory failures and resulting memory complaints, or are instead proactive and anticipatory in nature, perhaps being linked to general concerns about aging and beliefs about age-related memory decline.

Stress and intraindividual variability in memory complaints

Given the strong relationship of negative affect to memory complaints, an interesting question is whether intraindividual (within-person) fluctuations in emotional states and reactions might also produce intraindividual fluctuations in memory complaints. Previous work on questionnaire measures of memory self-concept (self-efficacy) indicated a high degree of stability of individual differences in these scales (e.g., McDonald-Mizsczak et al., 1995), which could indicate that these kinds of constructs are more trait-like than state-like.

However, one cannot generalize from long-term longitudinal studies of change to the issue of within-person variability. Sliwinski, Smyth, Hofer, and Stawski (2006) showed that response times in a measure of working memory manifested substantial within-person variability across days. Whereas stable individual differences in this aspect of working memory bore little relation to

individual differences in self-reported stress, within-person variation in stress and working memory were reliably coupled. When stress levels went up, working memory performance went down. Greater intraindividual variability in cognition and physiology has been found to predict long-term cognitive decline and mortality in old age (e.g., Ram, Gerstorf, Lindenberger, & Smith, 2011).

Studies of intraindividual variability in memory complaints could move the field in an entirely new direction, given three disparate sets of relevant findings. First, recent studies have identified links between memory complaints, stress levels, stress reactions (including circulating cortisol levels), and actual memory performance (e.g., Wolf et al., 2005). Individual differences in chronic exposure to stress and elevated cortisol are associated with reduced cognitive function in old age (Marin, Lord, Andrews, Juster, & Lupien, 2011; but see Sindi, Juster, Wan, Nair, Ying Kin, & Lupien, 2012).

Second, sleep disturbances, a somatic symptom of depression and a manifestation of disorders such as adult sleep apnea, are associated with greater subjective stress and with elevated subjective cognitive problems, including memory complaints in working adults (e.g., Van der Linden, Keijsers, Eling, & van Schaijk, 2005). Willert, Thulstrup, Hertz, and Bonde (2010) reported that a stress-reduction intervention, using a combination of mindfulness and cognitive behavioral therapy, reduced stress, improved sleep, and reduced reported cognitive problems, as measured by the CFQ. Garrett et al. (2010) reported that perceived stress moderated the relationship of memory complaints to compensatory behaviors as measured by the MCQ. Highly stressed individuals (who are typically also high in neuroticism) engaged in compensatory behaviors regardless of their level of memory complaint. Low-stress older individuals only reported memory compensation when they had high memory complaints.

Third, reliable intraindividual variability in memory complaints has been reported. Neupert, Almeida, Mroczek, and Spiro (2006) adapted the EMQ into a daily diary format, following older adults over an eight-day period. Daily within-person variation in memory complaints was predicted by the number of reported daily stressors; days with higher numbers of stressor also manifested more memory complaints. Follow-up analyses demonstrated that neuroticism amplified the relationship between stress and increased memory complaints (Neupert, Mroczek, & Spiro, 2008). Neurotic individuals were more likely to report higher memory complaints on their stressful days. Whitbourne, Neupert, and Lachman (2008) found that day-to-day variability in leisure activity and exercise covaried with reported memory failures. These studies demonstrate that memory complaints fluctuate according to variability in everyday life demands, activities, and stressors.

Further research on within-person variations in situational influences, including daily stressors, may illuminate the contexts of everyday memory failures by revealing how and when such failures are translated into memory complaints. Whereas between-person differences in memory complaints may be more a function of stable trait neuroticism, actual reactivity to stress may fluctuate within persons according to the context and consequences of experienced memory failures and their correlates (such as stress, intrusive thoughts, and cognitive load). The magnitude of intraindividual variability in memory complaints and its coupling to actual cognitive failures and their real-world consequences may be a better long-term predictor of negative outcomes than the overall level of memory complaints.

CONCLUSION

We believe it is safe to say that we no longer need further studies that merely correlate memory complaints scales with memory test performance and other variables. It is well-established that memory complaints

are weakly correlated with memory test performance and more strongly associated with emotional instability, depression, and negative affect. A more pressing question is: What can or should be done about the limited predictive validity of these scales?

There are a number of interesting suggestions in the field regarding how measurement of memory complaints can be improved and how the robust relationships of personality, depression, and complaints can be explained. In our view, research identifying individual differences in the processes and sources of information engaged when responding to complaints questions will be critical for advancing our understanding of complaints. The field would also benefit from additional longitudinal data that evaluate how changes in objective and subjective memory influence each other as people grow older. We would also argue that better techniques for assessing intraindividual fluctuations in everyday memory and memory complaints, such as intensive time sampling designs, have great potential for enriching our understanding of memory failures as they occur in everyday life.

There are also critical issues about how our understanding of memory complaints might advance differential diagnosis and treatment of older adults with concerns about their memory. We began the chapter by noting that there is a major difference between studying those who do and do not present at memory clinics complaining about memory problems, and studying memory complaints with questionnaires in typical samples. Yet the field has paid scant attention to the problem of self-referrals for memory problems and what it implies. What, specifically, are people actually concerned about as they complain about memory? What are the barriers to help-seeking by people with complaints even when those complaints are valid? Translational research in this domain is, at present, sorely lacking. The stage seems to be set for new and valuable advances in both basic and applied research questions about older adults' memory complaints.

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REFERENCES

Alexander, M .P., Stuss, D. T., & Fansabedian, N. (2003). California Verbal Learning Test: Performance by patients with focal frontal and non-frontal lesions. *Brain*, *126*, 1493–1503.

Antikainen, R., Honkalampi, K., Hänninen, T., Koivumaa-Honkanen, H., Tanskanen, A., Haatainen, K., & Viinamäki, H. (2004). A decrease in memory complaints is associated with mood improvement: A twelve-month follow up-study of depressed patients. *The European Journal of Psychiatry*, *18*, 143–152.

Antonell, A., Fortea, J., Rami, L., Bosch, B., Balasa, M., Sánchez-Valle, R., & Lladó, A. (2011). Different profiles of Alzheimer's disease cerebrospinal fluid biomarkers in controls and subjects with subjective memory complaints. *Journal of Neural Transmission*, *118*, 259–262.

Ayalon, L. (2011). The IQCODE versus a single-item informant measure to discriminate between cognitively intact individuals and individuals with dementia or cognitive impairment. *Journal of Geriatric Psychiatry & Neurology*, *24*, 168–173.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W H Freeman/Times Books/Henry Holt & Co.

Barnes, L. L., Schneider, J. A., Boyle, P. A., Bienias, J. L., & Bennett, D. A. (2006). Memory complaints are related to Alzheimer disease pathology in older persons. *Neurology*, *67*, 1581–1585.

Beaudoin, M., & Desrichard, O. (2011). Are memory self-efficacy and memory performance related? A meta-analysis. *Psychological Bulletin*, *137*, 211–241.

Berry, J. M., & West, R. L. (1993). Cognitive self-efficacy in relation to personal mastery and goal setting across the life span. *International Journal of Behavioral Development*, *16*, 351–379.

Broadbent, D. E., Cooper, P. F., FitzGerald, P., & Parkes, K. R. (1982). The Cognitive Failures Questionnaire (CFQ) and its correlates. *British Journal of Clinical Psychology*, *21*, 1–16.

Bruce, D. (1985). The how and why of ecological memory. *Journal of Experimental Psychology: General*, *114*, 78–90.

Buckley, T., Norton, M. C., Deberard, M., Welsh-Bohmer, K. A., & Tschanz, J. T. (2010). A brief metacognition questionnaire for the elderly: Comparison with cognitive performance and informant ratings The Cache County Study. *International Journal of Geriatric Psychiatry*, *25*, 739–747.

Bunce, D., Anstey, K. J., Cherbuin, N., Burns, R., Christensen, H., Wen, W., & Sachdev, P. S. (2010). Cognitive deficits are associated with frontal and temporal lobe white matter lesions in middle-aged adults living in the community. *PLOS ONE*, *5*(10), e13567.

Cacchione, P. Z., Powlishta, K. K., Grant, E. A., Buckles, V. D., & Morris, J. C. (2003). Accuracy of collateral source reports in very mild to mild dementia of the Alzheimer type. *Journal of the American Geriatrics Society*, *51*, 819–823.

Camp, C. J., West, R. L., & Poon, L. W. (1989). Recruitment practices for psychological research in gerontology. In M. P. Lawton and A. R. Herzog (Eds.), *Special research methods for gerontology*. (pp. 163–189). Amityville, NY: Baywood Publishing Co.

Cavallini, E., Bottiroli, S., Fastame, M. C., & Hertzog, C. (2013). The role of culture in aging stereotypes: Implicit theory and personal beliefs about memory. *Journal of Aging Studies*, *27*, 71–81.

Cavanaugh, J. C. (2000). Metamemory from a social-cognitive perspective. In D. Park and N. Schwarz (Eds.), *Cognitive aging: A primer* (pp. 115–130). Philadelphia, PA: Psychology Press.

Cavanaugh, J. C., Feldman, J. M., & Hertzog, C. (1998). Memory beliefs as social cognition: A reconceptualization of what memory questionnaires assess. *Review of General Psychology*, *2*, 48–65.

Cavanaugh, J. C., Grady, J. G., & Perlmutter, M. (1983). Forgetting and use of memory aids in 20 to 70 year olds' everyday life. *The International Journal of Aging & Human Development*, *17*, 113–122.

Chaytor, N., & Schmitter-Edgecombe, M. (2003). The ecological validity of neuropsychological tests: A review of the literature on everyday cognitive skills. *Neuropsychology Review*, *13*, 182–197.

Chung, J. C., & Man, D. K. (2009). Self-appraised, informant-reported, and objective memory and cognitive function in mild cognitive impairment. *Dementia & Geriatric Cognitive Disorders*, *27*, 187–193.

Corner, L., & Bond, J. (2004). Being at risk of dementia: Fears and anxieties of older adults. *Journal of Aging Studies*, *18*, 143–155.

Crane, M. K., Bogner, H. R., Brown, G. K., & Gallo, J. J. (2007). The link between depressive symptoms, negative cognitive bias and memory complaints in older adults. *Aging & Mental Health*, *11*, 708–715.

Crook, T. H., Bartus, R. T., Ferris, S. H., & Whitehouse, P. (1986). Age-associated memory impairment: Proposed diagnostic criteria and measures of clinical change: Report of a NIMH work group. *Developmental Neuropsychology*, *2*, 261–276.

Crook, T. H., & Larrabee, G. J. (1990). A self-rating scale for evaluating memory in everyday life. *Psychology & Aging*, *5*, 48–57.

Crook, T. H., Feher, E. P., & Larrabee, G. J. (1992). Assessment of memory complaint in age-associated memory impairment: The MAC-Q. *International Psychogeriatrics*, *4*, 165–176.

Cutler, S. J., & Grams, A. E. (1988). Correlates of self-reported everyday memory problems. *Journals of Gerontology*, *43*, S82–S90.

Cutler, S. J., & Hodgson, L.G. (1996). Anticipatory dementia: A link between memory appraisals and concerns about developing Alzheimer's disease. *The Gerontologist, 36*, 657–664.

Cuttler, C., & Graf, P. (2007). Personality predicts prospective memory task performance: An adult lifespan study. *Scandinavian Journal of Psychology*, *48*, 215–231.

Cuttler, C., Graf, P., Pawluski, J. L., & Galea, L. M. (2011). Everyday life memory deficits in pregnant women. *Canadian Journal of Experimental Psychology*, *65*, 27–37.

Debreuil, P., Adam, S., Bier, N., & Gagnon, L. (2007). The ecological validity of traditional memory evaluation in relation with controlled memory processes and routinization. *Archives of Clinical Neuropsychology*, 22, 979–989.

Dixon, R. A., & de Frias, C. M. (2007). Mild memory impairments differentially affect 6-year changes in compensatory strategy use. *Psychology and Aging*, *22*, 632–638.

Dixon, R. A., & Hultsch, D. F. (1983). Structure and development of metamemory in adulthood. *Journal of Gerontology*, *38*, 682–688.

Dixon, R. A., de Frias, C. M., & Bäckman, L. (2001). Characteristics of self-reported memory compensation in older adults. *Journal of Clinical & Experimental Neuropsychology*, *23*, 630–661.

Elfgren, C., Gustafson, L., Vestberg, S., & Passant, U. (2010). Subjective memory complaints, neuropsychological performance and psychiatric variables in memory clinic attendees: A 3-year follow-up study. *Archives of Gerontology & Geriatrics*, *51*, e110–e114.

Erk, S., Spottke, A., Meisen, A., Wagner, M., Walter, H., & Jessen, F. (2012). Evidence of neuronal compensation during episodic memory in subjective memory impairment. *Archives of General Psychiatry*, *68*, 845–852.

Farias, S., Mungas, D., & Jagust, W. (2005). Degree of discrepancy between self and other-reported everyday functioning by cognitive status: Dementia, mild cognitive impairment, and healthy elders. *International Journal of Geriatric Psychiatry*, *20*, 827–834.

Fisher, R. P., Amador, M., & Geiselman, R. E. (1989). Field-test of the cognitive interview – Enhancing the recollection of actual victims and witnesses of crimes. *Journal of Applied Psychology*, *74*, 722–727.

Garrett, D. D., Grady, C. L., & Hasher, L. (2010). Everyday memory compensation: The impact of cognitive reserve, subjective memory, and stress. *Psychology and Aging*, *25*, 74–83.

Gilewski, M. J., & Zelinski, E. M. (1986). Questionnaire assessment of memory complaints. In L. W. Poon, T. Crook, K. L. Davis, C. Eisdorfer, B. J. Gurland, A. W. Kaszniak, and L. W. Thompson (Eds.), *Handbook for clinical memory assessment of older adults* (pp. 93–107). Washington, DC: American Psychological Association.

Gilewski, M. J., Zelinski, E. M., & Schaie, K. W. (1990). The Memory Functioning Questionnaire for assessment of memory complaints in adulthood and old age. *Psychology & Aging*, *5*, 482–490.

Gruneberg, M. M., Morris, P. E., & Sykes, R. N. (1991). The obituary on everyday memory and its practical applications is premature. *American Psychologist*, *46*(1), 74–76.

Guerdoux, E., Dressaire, D., Martin, S., Adam, S., & Brouillet, D. (2012). Habit and recollection in healthy aging, mild cognitive impairment, and Alzheimer's disease. *Neuropsychology*, *26*, 517–533.

Gunning-Dixon, F. M., Brickman, A. M., Cheng, J. C., & Alexopoulos, G. S. (2009). Aging of cerebral white matter: A review of MRI findings. *International Journal of Geriatric Psychiatry*, *24*, 109–117.

Haley, A. P., Eagan, D. E., Gonzalez, M. M., Biney, F. O., & Cooper, R. A. (2011). Functional magnetic resonance imaging of working memory reveals frontal hypoactivation in middle-aged adults with cognitive complaints. *Journal of the International Neuropsychological Society*, *17*, 915–924.

Hänninen, T., Reinikainen, K. J., Helkala, E.-L., & Koivisto, K. (1994). Subjective memory complaints and personality traits in normal elderly subjects. *Journal of the American Geriatrics Society*, *42*, 1–4.

Hannon, R., Adams, P., Harrington, S., Fries-Dias, C., & Gipson, M. T. (1995). Effects of brain injury and age on prospective memory self-rating and performance. *Rehabilitation Psychology*, *40*(4), 289–298.

Herrmann, D. J. (1982). Know thy memory: The use of questionnaires to assess and study memory. *Psychological Bulletin*, *92*, 434–452.

Hertzog, C., & Hultsch, D. F. (2000). Metacognition in adulthood and old age. In F. I. M. Craik and T. A. Salthouse (Eds.), *The handbook of aging and cognition* (2nd ed.) (pp. 417–466). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

Hertzog, C., Dixon, R. A., & Hultsch, D. F. (1990). Relationships between metamemory, memory predictions, and task performance in adults. *Psychology & Aging, 5*, 215–227.

Hertzog, C., Dunlosky, J., & Robinson, A. E. (2009). Intellectual abilities and metacognitive beliefs influence spontaneous use of effective encoding strategies. Unpublished Manuscript.

Hertzog, C., Hultsch, D. F., & Dixon, R. A. (1989). Evidence for the convergent validity of two self-report metamemory questionnaires. *Developmental Psychology*, *25*, 687–700.

Hertzog, C., Park, D. C., Morrell, R. W., & Martin, M. (2000). Ask and ye shall receive: Behavioural specificity in the accuracy of subjective memory complaints. *Applied Cognitive Psychology*, *14*, 257–275.

Herzog, A. R., & Rodgers, W. L. (1989). Age differences in memory performance and memory ratings as measured in a sample survey. *Psychology and Aging*, *4*, 173–182.

Hohman, T. H., Beason-Held, L. L., Lamar, M., & Resnick, S. B. (2011). Subjective cognitive complaints and longitudinal changes in memory and brain function. *Neuropsychology*, *25*, 125–130.

Holsinger, T., Deveau, J., Boustani, M., & Williams, J. W., Jr. (2007). Does this patient have dementia? *JAMA: Journal of the American Medical Association*, *297*, 2391–2404.

Hultsch, D. F., Hertzog, C., & Dixon, R. A. (1987). Age differences in metamemory: Resolving the inconsistencies. *Canadian Journal of Psychology*, *41*, 193–208.

Hurt, C. S., Burns, A., Brown, R. G., & Barrowclough, C. (2012). Why don't older adults with subjective memory complaints seek help? *International Journal of Geriatric Psychiatry*, *27*, 394–400.

Isella, V. V., Villa, L. L., Russo, A. A., Regazzoni, R. R., Ferrarese, C. C., & Appollonio, I. M. (2006). Discriminative and predictive power of an informant report in mild cognitive impairment. *Journal of Neurology, Neurosurgery & Psychiatry*, *77*, 166–171.

Jessen, F., Feyen, L., Freymann, K., Tepest, R., Maier, W., Heun, R., & Scheef, L. (2006). Volume reduction of the entorhinal cortex in subjective memory impairment. *Neurobiology of Aging*, *27*, 1751–1756.

Jopp, D., & Hertzog, C. (2007). Activities, self-referent memory beliefs, and cognitive performance: Evidence

for direct and mediated relations. *Psychology & Aging*, *22*, 811–825.

Jorm, A. F. (2004). The Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE): A review. *International Psychogeriatrics*, *16*, 275–293.

Jorm, A. F., Butterworth, P. P., Anstey, K. J., Christensen, H. H., Easteal, S. S., Maller, J. J., & Sachdev, P. P. (2004). Memory complaints in a community sample aged 60–64 years: Associations with cognitive functioning, psychiatric symptoms, medical conditions, APOE genotype, hippocampus and amygdala volumes, and white-matter hyperintensities. *Psychological Medicine: A Journal of Research in Psychiatry & the Allied Sciences*, *34*, 1495–1506.

Jorm, A. F., Scott, R., & Jacomb, P. A. (1989). Assessment of cognitive decline in dementia by informant questionnaire. *International Journal of Geriatric Psychiatry*, *4*, 35–39.

Kahn, R. L., Zarit, S. H., Hilbert, N. M., & Niederehe, G. (1975). Memory complaint and impairment in the aged: The effect of depression and altered brain function. *Archives of General Psychiatry*, *32*, 1569–1573.

Kaszniak, A. W. (1990). Psychological assessment of the aging individual. In J. E. Birren and K. W. Schaie (Eds.), *Handbook of the psychology of* aging (3rd ed., pp. 427–445). New York: Academic Press.

Kliegel, M., & Jäger, T. (2006). Can the Prospective and Retrospective Memory Questionnaire (PRMQ) predict actual prospective memory performance? *Current Psychology*, *25*(3), 182–191.

Kverno, K. S. (2000). Trait anxiety influences on judgments of frequency and recall. *Personality & Individual Differences*, *29*, 395–404.

La Rue, A., Small, G., McPherson, S., & Komo, S. (1996). Subjective memory loss in age-associated memory impairment: Family history and neuropsychological correlates. *Aging, Neuropsychology, & Cognition, 3*, 132–140.

Lachman, M. E., Bandura, M., Weaver, S. L., & Elliott, E. (1995). Assessing memory control beliefs: The Memory Controllability Inventory. *Aging & Cognition*, *2*(1), 67–84.

Lane, C. J. & Zelinski, E. M. (2003). Longitudinal hierarchical linear models of the Memory Functioning Questionnaire. *Psychology & Aging*, *18*(1), 38–53. doi: 10.1037/0882-7974.18.1.38

Leshikar, E. D., Duarte, A., & Hertzog, C. (2012). Task-selective memory effects for successfully implemented encoding strategies. *PLoS:ONE*, *7*(5), e38160

Levine, B., Stuss, D. T., Winocur, G., Binns, M. A., Fahy, L., Mandich, M., Bridges, K., & Robertson, I. H. (2007). Cognitive rehabilitation in the elderly: Effects on strategic behavior in relation to goal management. *Journal of the International Neuropsychological Society*, *13*, 143–152.

Levy, B., & Langer, E. (1994). Aging free from negative stereotypes: Successful memory in China and among the American deaf. *Journal of Personality & Social Psychology*, *66*, 989–997.

Lineweaver, T. T., & Hertzog, C. (1998). Adults' efficacy and control beliefs regarding memory and aging: Separating general from personal beliefs. *Aging, Neuropsychology, & Cognition*, *5*, 264–296.

Loewenstein, D. A., Argüelles, S., Bravo, M., Freeman, R. Q., Argüelles, T., Acevedo, A., & Eisdorfer, C. (2001). Caregivers' judgments of the functional abilities of the Alzheimer's disease patient: A comparison of proxy reports and objective measures. *The Journals of Gerontology: Series B: Psychological Sciences*, *56B*, P78–P84.

Mäntylä, T. (2003). Assessing absentmindedness: Prospective memory complaint and impairment in middle-aged adults. *Memory & Cognition*, *31*, 15–25.

Mäntylä, T., & Göran-Nilsson, L. (1997). Remembering to remember in adulthood: A population-based study on aging and prospective memory. *Aging, Neuropsychology, & Cognition*, *4*, 81–92.

Mäntylä, T., Rönnlund, M., & Kliegel, M. (2010). Components of executive functioning in metamemory. *Applied Neuropsychology*, *17*, 289–298.

Marin, M-F., Lord, C., Andrews, J., Juster, R-P, & Lupien, S. J. (2011). Chronic stress, cognitive functioning, and mental health. *Neurobiology of Learning and Memory*, *96*, 583–595.

Mascherek, A., & Zimprich, D. (2011). Correlated change in memory complaints and memory performance across 12 years. *Psychology & Aging*, *26*, 884–889.

Mascherek, A., Zimprich, D., Rupprecht, R., & Lang, F. R. (2011). What do cognitive complaints in a sample of memory clinic outpatients reflect? *GeroPsych: The Journal of Gerontopsychology & Geriatric Psychiatry*, *24*, 187–195.

McDonald-Miszczak, L., Hertzog, C., & Hultsch, D. F. (1995). Stability and accuracy of metamemory in adulthood and aging: A longitudinal analysis. *Psychology & Aging*, *10*, 553–564.

McFarland, C., Ross, M., & Giltrow, M. (1992). Biased recollections in older adults: The role of implicit theories of aging. *Journal of Personality & Social Psychology*, *62*(5), 837–850.

McGlynn, S. M., & Schacter, D. L. (1989). Unawareness of deficits in neuropsychological syndromes. *Journal of Clinical & Experimental Neuropsychology*, *11*(2), 143–205.

Minett, T. S. C., Dean, J. L., Firbank, M., English, P., & O'Brien, J. T. (2005). Subjective memory complaints, white-matter lesions, depressive symptoms, and cognition in elderly patients. *The American Journal of Geriatric Psychiatry*, *13*(8), 665–671.

Neupert, S. D., Almeida, D. M., Mroczek, D. K., & Spiro, A. (2006). Daily stressors and memory failures in a natural setting: Findings from the VA Normative Aging Study. *Psychology and Aging*, *21*, 424–429.

Neupert, S. D., Mroczek, D. K., & Spiro, A. (2008). Neuroticism moderates the daily relation between stressors and memory failures. *Psychology and Aging*, *23*, 287–296.

Niederehe, G,. & Yoder, C. (1989). Metamemory perceptions in depressions of young and older adults. *The Journal of Nervous & Mental Disease*, *177*, 4–14.

Okada, K., Vilberg, K. L., & Rugg, M. D. (2012). Comparison of the neural correlates of retrieval successes in tests of cued recall and recognition memory. *Human Brain Mapping*, *33*, 523–533.

Pannu, J. K., & Kaszniak, A. W. (2005). Metamemory experiments in neurological populations: A review. *Neuropsychology Review*, *15*, 105–130.

Parisi, J. M., Gross, A. L., Rebok, G. W., Saczynski, J. S., Crowe, M., Cook, S. E., & Unverzagt, F. W. (2011). Modeling change in memory performance and memory perceptions: Findings from the ACTIVE study. *Psychology & Aging*, *26*(3), 518–524.

Park, D. C., Hertzog., C., Leventhal, H., Morrell, R. W., Leventhal, E., Birchmore, D., Martin, M., & Bennett, J. (1999). Medication adherence in rheumatoid arthritis patients: Older is wiser. *Journal of the American Geriatric Society*, *47*, 172–183.

Pearman, A. (2009). Predictors of subjective memory in young adults. *Journal of Adult Development*, *16*(2), 101–107.

Pearman, A., & Storandt, M. (2004). Predictors of subjective memory in older adults. *The Journals of Gerontology: Series B: Psychological Sciences & Social Sciences*, *59B*, P4–6.

Pearman, A., & Storandt, M. (2005). Self-discipline and self-consciousness predict subjective memory in older adults. *The Journals of Gerontology: Series B: Psychological Sciences & Social Sciences*, *60B*, P153–157.

Pearman, A., Gerstorf, D., & Hertzog, C. (2013). Subjective memory complaints in the oldest old: Cross-sectional and longitudinal findings. Unpublished manuscript.

Perrotin, A., Mormino, A. C., Madison, C. M., Hayenga, A. O., & Jagust, W. J. (2012). Subjective cognition and amyloid deposition imaging: A Pittsburgh Compound B Positive Emission Tomography study in normal elderly individuals. *Archives of Neurology*, *69*, 223–229.

Petersen, R. C., Smith, G. E., Waring, S. C., Ivnik, R. J., Tangalos, E. G., & Kokmen, E. (1999). Mild cognitive impairment: Clinical characterization and outcome. *Archives of Neurology*, *56*, 303–308.

Plassman, B., Langa, K., Fisher, G., Heeringa, S., Weir, D., Ofstedal, M., & Wallace, R. (2008). Prevalence of cognitive impairment without dementia in the United States. *Annals of Internal Medicine*, *148*, 427–434.

Plotkin, D. A., Mintz, J., & Jarvik, L. F. (1985). Subjective memory complaints in geriatric depression. *The American Journal of Psychiatry*, *142*, 1103–1105.

Ponds, R. & Jolles, J. (1996). Memory complaints in elderly people: The role of memory abilities, metamemory, depression, and personality. *Educational Gerontology*, *22*, 341–357.

Rabbitt, P. & Abson, V. (1990). 'Lost and found': Some logical and methodological limitations of self-report questionnaires as tools to study cognitive ageing. *British Journal of Psychology*, *81*, 1–16.

Rabbitt, P., Maylor, E., McInnes, L., & Bent, N. (1995). What goods can self-assessment questionnaires deliver for cognitive gerontology? *Applied Cognitive Psychology*, *9*, S127–152.

Ram, N., Gerstorf, D., Lindenberger, U., & Smith, J. (2011). Developmental change and intraindividual variability: Relating cognitive aging to cognitive plasticity, cardiovascular lability, and emotional diversity. *Psychology and Aging*, *26*, 363–371.

Ramakers, I. B., Visser, P., Bittermann, A. N., Ponds, R. M., van Boxtel, M. J., & Verhey, F. J. (2009). Characteristics of help-seeking behaviour in subjects with subjective memory complaints at a memory clinic: A case-control study. *International Journal of Geriatric Psychiatry*, *24*, 190–196.

Rasmusson, D. X., Rebok, G. W., Bylsma, F. W., & Brandt, J. (1999). Effects of three types of memory training in normal elderly. *Aging, Neuropsychology, & Cognition*, *6*, 56–66.

Rast, P., Zimprich, D., van Boxtel, M., & Jolles, J. (2009). Factor structure and measurement invariance in the Cognitive Failures Questionnaire across the adult life span. *Assessment*, *16*, 145–158.

Roberts, J. L., Clare, L., & Woods, R. T. (2009). Subjective memory complaints and awareness of memory functioning in mild cognitive impairment: A systematic review. *Dementia and Geriatric Cognitive Disorders*, *28*(2), 95–109.

Rönnlund, M., Vestergren, P., Mäntylä, T., & Göran-Nilsson, L. (2011). Predictors of self-reported prospective and retrospective memory in a

population-based sample of older adults. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *172*, 266–284.

Ryan, E. B. & Kwong See, S. (1993). Age-based beliefs about memory changes for self and others across adulthood. *Journals of Gerontology*, *48*, P199–201.

Salthouse, T. A., Berish, D. E., & Siedlecki, K. L. (2004). Construct validity and age sensitivity of prospective memory. *Memory & Cognition*, *32*, 1133–1148.

Schleser, R., West, R. L., & Boatwright, L. K. (1986). A comparison of recruiting strategies for increasing older adults' initial entry and compliance in a memory training program. *The International Journal of Aging & Human Development*, *24*, 55–66.

Schmand, B., Jonker, C., Gerrlings, M. I., & Lindeboom, J. (1997). Subjective memory complaints in the elderly: depressive symptoms and future dementia. *British Journal of Psychiatry*, *171*, 373–376.

Schofield, P. W., Jacobs, D., Marder, K., Sano, M., & Stern, Y. (1997). The validity of new memory complaints in the elderly. *Archives of Neurology*, *54*, 756–759.

Schoonenboom, N. S. M., Reesink, F. E., Verwey, N. A., Kester, M. I., Teunissen, C. E., van de Ven, P. M., &van der Flier, W. M. (2012). Cerebrospinal fluid markers for differential dementia diagnosis in a large memory clinic cohort. *Neurology*, *78*, 47–54.

Scogin, F., Storandt, M., & Lott, L. (1985). Memory-skills training, memory complaints, and depression in older adults. *Journal of Gerontology*, *40*, 562–568.

Scott, S. & Walter, F. (2010). Studying help-seeking for symptoms: The challenges of methods and models. *Social & Personality Psychology Compass*, *4*(8), 531–547.

Sims, R. C., Whitfield, K. E., Ayotte, B. J., Gamaldo, A. A., Edwards, C. L., & Allaire, J. C. (2011). Subjective memory in older African Americans. *Experimental Aging Research*, *37*, 220–240.

Sindi, S., Juster, R-P., Wan, N., Nair, N. P. V., Ying Kin, N., & Lupien, S. J. (2012). Depressive symptoms, cortisol, and cognition during human aging: The role of negative aging perceptions. *Stress*, *15*, 130–137.

Slavin, M. J., Brodaty, H., Kochan, N. A., Crawford, J. D., Trollor, J. N., Draper, B., & Sachdev, P. S. (2010). Prevalence and predictors of 'subjective cognitive complaints' in the Sydney Memory and Ageing Study. *The American Journal of Geriatric Psychiatry*, *18*, 701–710.

Sliwinski, M. J., Smyth, J. M., Hofer, S. M., & Stawski, R. J. (2006). Intraindividual coupling of stress and cognition. *Psychology and Aging*, *21*, 545–557.

Smith, G., Sala, S., Logie, R. H., & Maylor, E. A. (2000). Prospective and retrospective memory in normal ageing and dementia: A questionnaire study. *Memory*, *8*, 311–321.

Smith, R. E. (2003). The cost of remembering to remember in event-based prospective memory: Investigating the capacity demands of delayed intention performance. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, *29*, 347–361.

Snitz, B. E., Morrow, L. A., Rodriguez, E. G., Huber, K. A., & Saxton, J. A. (2008). Subjective memory complaints and concurrent memory performance in older patients of primary care providers. *Journal of the International Neuropsychological Society*, *14*, 1004–1013.

Stewart, R., Godin, O., Crivello, F., Maillard, P., Mazoyer, B., Tzourio, C., & Dufouil, C. (2011). Longitudinal neuroimaging correlates of subjective memory impairment: 4-year prospective community study. *British Journal of Psychiatry*, *198*, 199–205.

Strunk, D. R., & Adler, A. D. (2009). Cognitive biases in three prediction tasks: A test of the cognitive model of depression. *Behaviour Research & Therapy*, *47*, 34–40.

Strunk, D. R., Lopez, H., & DeRubeis, R. J. (2006). Depressive symptoms are associated with unrealistic negative predictions of future life events. *Behaviour Research & Therapy*, *44*, 861–882.

Sunderland, A., Watts, K., Baddeley, A. D., & Harris, J. E. (1986). Subjective memory assessment and test performance in elderly adults. *Journal of Gerontology*, *41*, 376–384.

Taylor, J. L., Miller, T. P., & Tinklenberg, J. R. (1992). Correlates of memory decline: A 4-year longitudinal study of older adults with memory complaints. *Psychology & Aging*, *7*, 185–193.

Uttl, B., & Kibreab, M. (2011). Self-report measures of prospective memory are reliable but not valid. *Canadian Journal of Experimental Psychology*, *65*, 57–68.

van der Flier, W. M., Pijnenburg, Y. A. L., Schoonenboom, S. N. M., Dik, M. G., Blankenstein, M. A., & Scheltens, P. (2008). Distribution of APOE genotypes in a memory clinic cohort. *Dementia & Geriatric Cognitive Disorders*, *25*, 433–438.

Van der Linden, D., Keijsers, G. P. J., Eling, P., & van Schaijk, R. (2005). Work stress and attentional difficulties: An initial study on burnout and cognitive failures. *Work & Stress*, *19*, 23–36.

van Norden, A. W., Fick, W. F., de Laat, K. F., van Uden, I. M., van Oudheusden, L. B., Tendolkar, I. I., Zwiers, & de Leeuw, F. E. (2008). Subjective cognitive failures and hippocampal volume in elderly with white matter lesions. *Neurology*, *71*, 1152–1159.

Verma, S. K., Pershad, D. D., Kaur, R., & Bhagat, K. (1996). Personality correlates of perceived memory disturbances. *Journal of Personality & Clinical Studies*, *12*, 33–36.

Vestergren, P., & Nilsson, L-G. (2011). Perceived everyday memory problems in a population sample aged 25–99. *Applied Cognitive Psychology*, *25*, 641–646.

Volz-Sidiropoulou, E., & Gauggel, S. (2012). Do subjective measures of attention and memory predict actual performance? Metacognition in older couples. *Psychology and Aging*, *27*, 440–450.

Whitbourne, S. B., Neupert, S. D., & Lachman, M. E. (2008). Daily physical activity: Relation to everyday memory in adulthood. *Journal of Applied Gerontology*, *27*, 331–349.

Wickens, C. M., Toplak, M. E., & Wiesenthal, D. L. (2008). Cognitive failures as predictors of driving errors, lapses, and violations. *Accident Analysis and Prevention*, *40*, 1223–1233.

Willert, M. V., Thulstrup, A. M., Hertz, J., & Bonde, J. P. (2010). Sleep and cognitive failures improved by a three-month stress management intervention. *International Journal of Stress Management*, *17*, 193–213.

Winblad, B., Palmer, K., Kivipelto, M., Jelic, V., Fratiglioni, L., Wahlund, L., & Petersen, R. (2004). Mild cognitive impairment – beyond controversies, towards a consensus: Report of the International Working Group on MCI. *Journal of Internal Medicine*, *256*, 240–246.

Wolf, O. T., Dziobek, I., McHugh, P., Sweat, V., de Leon, M. J., Javier, E., & Convit, A. (2005). Subjective memory complaints in aging are associated with elevated cortisol. *Neurobiology of Aging*, *26*, 1357–1363.

Zarit, S. H., Gallagher, D., & Kramer, N. (1981). Memory training in the community aged: Effects on depression, memory complaint, and memory performance. *Educational Gerontology*, *6*, 11–27.

Zelinski, E. M., & Gilewski, M. J. (2004). A 10-item Rasch modeled memory self-efficacy scale. *Aging & Mental Health*, *8*, 293–306.

Zelinski, E. M., Gilewski, M. J., & Anthony-Bergstone, C. R. (1990). Memory Functioning Questionnaire: Concurrent validity with memory performance and self-reported memory failures. *Psychology & Aging*, *5*, 388–399.