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Everyday Functioning and Cognitive Correlates in Healthy Older Adults with Subjective Cognitive Concerns

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Abstract

Objective—Few studies have examined functional abilities and complaints in healthy older adults with subjective cognitive concerns (SCC). The aims of this study were to assess everyday functioning in healthy older adults reporting high and low amounts of SCC, and examine cognitive correlates of functional abilities.

Method—Twenty-six healthy older adults with high SCC, and 25 healthy older adults with low SCC, as well as their knowledgeable informants completed the Instrumental Activities of Daily Living-Compensation (IADL-C), a questionnaire measure of everyday functioning.

Results—After controlling for depression, the high SCC group self-reported significantly more everyday difficulties on the IADL-C, including all subdomains. Compared to the low SCC group, informants for the high SCC group endorsed more difficulties on the IADL-C and specifically the social skills subdomain. For the high SCC group, poorer self-report of everyday functioning was related to poorer executive functioning and temporal order memory.

Conclusions—These findings indicate that there may be subtle functional changes that occur early in the spectrum of cognitive decline in individuals with high SCC, and these functional changes are evident to informants. Further work is needed to investigate whether individuals with both SCC and functional difficulties are at an even higher risk for progression to mild cognitive impairment.

Keywords

Executive function; Aging; Memory; Cognition; Memory complaints

Instrumental activities of daily living (IADLs) are higher-level, complex everyday activities (e.g., cooking, medication management). As IADLs are more complex and cognitively demanding than lower-level activities of daily living (ADLs, e.g., bathing, dressing), they are more likely to be vulnerable to early changes in cognition and be affected earlier in the course of cognitive decline (Goldberg et al., 2010). Impairments in functional abilities are a diagnostic feature of dementia and a common finding among individuals with mild cognitive

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impairment (MCI; e.g., Gold, Park, Troyer, & Murphy, 2015; Puente, Terry, Faraco, Brown, & Miller, 2014; Thomas & Marsiske, 2014). With cognitive impairment in aging believed to follow a continuum from healthy aging, pre-MCI with subjective cognitive concerns, MCI, and dementia (e.g., Loewenstein et al., 2012; Reisberg & Gauthier, 2008), mild changes in functional abilities may be present even in the earliest stages of cognitive decline. In this study, we investigate self- and informant-report of functional abilities and cognitive correlates in cognitively healthy older adults (HOAs) reporting either high or low subjective cognitive concerns (SCC).

Subjective cognitive concerns are perceived changes or declines in cognition, most commonly memory, but also working memory, attention, and executive functioning (e.g., Langlois & Belleville, 2014), reported by the individual which may or may not be perceived by others. The prevalence of SCC ranges between 25 to 50% (Jonker, Geerling, & Schmand, 2000, age >18), with one study reporting a rate of 34% in older adults without dementia or depression (Jonker, Launer, Jooijer, & Lindeboom, 1996). In attempts to define the earliest symptoms of decline along the aging spectrum, self-perceived cognitive decline has become a significant focus of research, and the importance of SCC as a diagnostic criterion has already been noted in MCI (Albert et al., 2011; Winblad et al., 2004) and in the conceptual framework for “pre-MCI subjective cognitive decline” (SCD; Jessen et al., 2014). This heterogeneous stage where cognitive complaints are present despite intact neuropsychological performance may be a symptomatic indicator of preclinical Alzheimer’s disease (AD), preceding MCI and/or dementia by up to 15 years (Gauthier et al., 2006). In addition, positive links have been found between SCC and neuropathology (e.g., amyloid burden, white and gray matter integrity) common in MCI and AD (e.g., Amariglio et al., 2012; Molinuevo et al., 2014; Peter et al., 2014).

Many terms have been used for this SCC group of individuals or stage of cognitive impairment. Studies that have compared the neurocognitive test performances of individuals with SCC relative to controls have most often found numerically lower, although intact, scores (e.g., Nutter-Upham et al., 2008; Peter et al., 2014; Reisberg, Shulman, Torossian, Leng, & Zhu, 2010). Although less frequent, a few studies have found statistically significant differences in cognition between SCC and control groups (e.g., Amariglio et al., 2012; Archer et al., 2006; Buelow, Tremont, Frakey, Grace, & Ott, 2014; Caselli et al., 2014; Dik et al., 2001; Rabin et al., 2006).

Despite findings which indicate that functional abilities decline along the aging spectrum (e.g., Langois & Belleville, 2014; Schmitter-Edgecombe & Parsey, 2014a), it is surprising that little attention has been paid to the functional abilities or even functional complaints amongst those with SCC. For example, Rabin et al. (2009) found that performances on the Test of Practical Judgment (TOP-J), an objective performance instrument that assesses practical judgment and problem solving skills, were significantly poorer in the SCC group compared to controls, and were comparable to individuals with MCI. These findings suggest that early changes in higher-order IADLs may be present in those with SCC. Other data suggest a relationship between SCC and later cognitive and functional decline (e.g., Duara et al., 2011; Gifford et al., 2014; Reisberg et al., 2010; Rickenbach, Almeida, Seeman, & Lachman, 2014). For example, Donovan et al. (2014) found that an SCC group with no

objective impairment was four times more likely to progress to MCI compared with a control group over a mean follow-up period of 2.4 years. Furthermore, in a large cohort study, Jessen et al. (2011) found that SCC, both with and without worry, and performance on a measure of IADLs were among the best set of baseline variables which predicted dementia. However, the relationship between SCC and IADLs was not directly examined at baseline.

In this study, we examine self- and informant- reported functional abilities in individuals with varying levels of SCC. There are several approaches to measuring everyday functioning, including self-report and informant-report questionnaires, as well as performance-based measures. Each of these methods has advantages and disadvantages (see for reviews Moore, Palmer, Patterson, & Jeste, 2007; Sikkes, de Lange-de Klerk, Pijnenburg, Scheltens, & Uitdehaag, 2009). Questionnaires are one of the cheapest and easiest methods for data collection and are the most widely used proxy measure for functional status. Several newer questionnaires have been developed specifically to capture the mild functional changes seen in the earlier stages of decline (e.g., ECog, Farias et al., 2008; ADL-PI, Galasko et al., 2006). Recently, Schmitter-Edgecombe, Parsey, and Lamb (2014) found greater informant-reported functional impairment with increasing age and cognitive compromise using a newly developed questionnaire, the Instrumental Activities of Daily Living-Compensation (IADL-C), which takes into account compensatory strategy use.

We also examine cognitive correlates of functional abilities in individuals with SCC. Although it remains unclear as to which cognitive abilities are most predictive of everyday functioning, memory and executive functioning appear to be the most widely investigated and frequent predictors of functional status in both HOAs and older adults with MCI (e.g., Cahn-Weiner, Boyle, & Malloy, 2002; McAlister, Schmitter-Edgecombe, & Lamb, 2016; Schmitter-Edgecombe, McAlister, & Weakley, 2012; Vaughan & Giovanello, 2010). Recent studies have also indicated that noncontent memory processes (i.e., prospective memory and temporal order memory), which have been linked to executive functioning and the frontal lobes (e.g., Glisky & Kong, 2008; Turner, Simons, Gilbert, Frith, & Burgess, 2008), make an independent contribution to the prediction of functional abilities in both HOAs and MCI (e.g., McAlister & Schmitter-Edgecombe, 2013; Schmitter-Edgecombe et al., 2012; Schmitter-Edgecombe, Woo, & Greeley, 2009; Woods, Weinborn, Velnoweth, Rooney, & Bucks, 2012). Two recent studies that examined prospective memory in SCC groups found mixed results. While Chi et al. (2014) did not find significantly poorer accuracy of prospective memory for the SCC group compared to HOAs, Rabin et al. (2014) found that individuals with SCC performed significantly lower than HOAs on a long-term, more naturalistic subtask of prospective memory. Neither study examined the relationship between noncontent memory processes and everyday functioning in SCC groups. Furthermore, to our knowledge, no study has examined temporal order memory in individuals with SCC.

In the current study, HOAs with high and low levels of SCC and their informants completed a questionnaire measure of everyday functioning, the IADL-C. The primary aims were to assess functional abilities in SCC and to examine cognitive correlates of functional abilities in the high SCC group. Based on prior research (e.g., Rabin et al., 2009), we expected that the high SCC group would report more difficulties with everyday functioning than the low

SCC group. Furthermore, we were interested in whether informants would also report more functional difficulties for the high SCC group compared to the low SCC group. Although exploratory, we hypothesized that cognition, and especially memory and executive functioning, would be associated with functional abilities in the high SCC group. We were especially interested in whether noncontent memory processes (i.e., temporal order memory and prospective memory) would be associated with functional abilities in the high SCC group.

Method

Participants

Participants were a subset ($n = 120$, ages 50–89, $M = 67.63$, $SD = 9.29$) from a sample of individuals ($n = 231$) who underwent neuropsychological assessment as part of a memory and aging study investigating cognitive difficulties across the continuum from healthy aging to dementia. Participants were recruited through advertisements, community health and wellness fairs, physician and local agency referrals, and from past studies in our laboratory. All participants functioned independently in the community. Initial screening was conducted over the phone and included: (a) a medical interview to rule out exclusion criteria, and (b) the Telephone Interview for Cognitive Status (TICS, Brandt & Folstein, 2003) to exclude participants who scored below 21 (moderately to severely impaired range) and therefore were unlikely to be able to complete the study protocol.

Those who met initial screening criteria completed standardized and experimental neuropsychological tests. Participants for this study represented the study sample that was classified as HOA. The study participants did not meet criteria for MCI, as outlined by the National Institute on Aging Alzheimer's Association workgroup (Albert et al., 2011), or dementia (American Psychiatric Association, 2000). Other exclusionary criteria included significant symptoms of depression (Patient-Reported Outcomes Measurement Information System; PROMIS 8-item Depression- Short Form T score > 60 ; Pilkonis, et al., 2011); history of brain surgery, cerebrovascular accident, or head trauma with permanent brain lesion; current or recent (i.e., within the past year) psychoactive substance abuse; and a known medical, neurological, or psychiatric condition that could cause cognitive dysfunction (e.g., Parkinson's disease, multiple sclerosis). As compensation, participants were given pre-paid parking passes and a report documenting their performance on the neuropsychological tests. In addition, participants were compensated for travel. This protocol was reviewed and approved by the Institutional Review Board.

Classification of cognitive concern—Participants were classified into two groups (i.e., high SCC and low SCC) based on level of SCC. Level of SCC was assessed and determined from participant responses on the PROMIS Applied Cognition-Abilities Short Form 8a (Cella et al., 2007; Fries et al., 2005; Saffer, Lanting, Koehle, Klonsky, & Iverson, 2015), an 8-item questionnaire measure of participants' subjectively-experienced cognitive functioning during the past seven days (e.g., my mind has been as sharp as usual). It uses a 5-point Likert scale from 1 (*not at all*) to 5 (*very much*). Consistent with the current conceptual framework for SCC (Jessen et al., 2014), this questionnaire assesses a variety of cognitive

complaints rather than focusing exclusively on subjective memory complaints. A total SCC index was calculated by summing participants' responses to each item. Scores could range from 8 to 40 with higher scores reflecting better perceived cognitive functioning ($M = 32.58$, $SD = 5.74$, range 9–40; T-score $M = 52.42$, $SD = 6.04$).

Participant's performance on the PROMIS Applied Cognition-Abilities short form was then divided into quartiles. The top 25% of individuals ($N = 25$) endorsed the fewest number of SCC ($M = 39.20$, $SD = .76$, range 38–40; T-score $M = 45.13$, $SD = 4.27$) and were designated the low SCC group. This group generally responded by indicating that their cognitive abilities during the past seven days were "quite a bit" to "very much" as good as usual. The bottom 25% of individuals ($N = 26$) endorsed the most SCC ($M = 24.73$, $SD = 5.20$, range 9–29; T-score $M = 61.43$, $SD = 3.07$) and were designated as the high SCC group. The high SCC group generally responded by indicating their cognitive abilities were only "quite a bit" to "somewhat" as good as usual during the past seven days. The middle 50% of individuals ($M = 33.40$, $SD = 2.14$, range 30–37; T-score $M = 52.38$, $SD = 2.05$) were not included in subsequent analyses so that we could more directly compare the performances of community-dwelling older adults who were self-reporting cognitive concerns with those who reported little to no cognitive concerns.

Knowledgeable informants—Thirty-six of the study's 51 participants (18 low SCC and 18 high SCC) had knowledgeable informants who answered questions about the participant's cognition and general health. Informants had a mean age of 61.47 years ($SD = 16.43$, range 20–88) and a mean education level of 16.53 years ($SD = 2.88$, range 10–20). Sixty-four percent ($N = 23$) of the informant sample was female and 36% ($N = 13$) was male. The informant sample consisted of 58% spouses, 14% children, 6% parents, 17% siblings and friends, and 5% other. Seventy-five percent of informants indicated that they lived with or saw the participant almost daily, whereas 6%, 11%, and 8% of informants indicated seeing the participant 3–5× per week, 1–2× per week, and less than once per week, respectively. No formal cognitive testing of informant cognitive status was conducted. The makeup of the informant sample did not differ between the high SCC and low SCC groups, $\chi^2(5) = 2.57$, $p = .77$.

Measures

Self-report and informant-report measures—*Instrumental Activities of Daily Living: Compensation Scale* (IADL-C; Schmitter-Edgecombe et al., 2014). Participants and their knowledgeable informants completed the 27-item questionnaire of everyday functioning that indexed the following four subdomains: money and self-management, home and daily living, travel and event memory, and social skills. Items were rated using an 8-point Likert scale, ranging from 1 (*independent, as well as ever, no aid*) to 8 (*not able to complete activity anymore*). Ratings included four levels of independent functioning (1–4 with items 2 and 3 reflecting compensatory aid use), as well as indicators for needing increasing amounts of assistance (5–7) and options for "unable to complete" (8) and "does not need to complete the activity" or "no basis for judgment" (informant version only). A total score and four subdomain composite scores were created by summing the items.

Eight-item PROMIS Depression- Short Form (Pilkonis et al., 2011). In addition to a measure of everyday functioning, a self-report measure of depression was also administered. Participants rated depressive symptoms (e.g., I felt like a failure), referencing the past seven days, on a 5-point Likert scale from 1 (*never*) to 5 (*always*). A depression score was calculated by summing participants' responses to each item.

Cognitive measures—The measures of memory and executive functioning represent constructs prior research suggests play an important role in functional abilities. The measures representing processing speed and picture naming represent constructs that have not consistently been linked with functional abilities. The measures representing prospective memory and temporal order memory were chosen to explore the relationship between noncontent memory processes and functional abilities.

Memory Assessment Scale: Prose Memory subtest (MAS; Williams, 1991). Participants were read a short story and asked nine questions about the story after a long delay. The total number of nine questions correctly answered was used as the measure of retrospective content memory.

Delis-Kaplan Executive Function System: Color-Word Interference Test subtest (D-KEFS; CWIT; Delis, Kaplan, & Kramer, 2001). Executive functioning was measured using the total time to complete the third version of the CWIT in which participants were asked to suppress an automatic response (word reading) in favor of a novel response (color naming).

Trail Making Test (TMT; Reitan & Wolfson, 1985). Participants were asked to rapidly alternate between connecting numbers (Trails A), and numbers and letters (Trails B). The times the individual took to complete Trails A, and Trails B minus Trails A divided by Trails A were used as measures of processing speed and executive function, respectively.

Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 1983). Participants were asked to name line-drawings of objects that varied in level of difficulty. Total naming score was used as a measure of language abilities.

Activity-Based Multiple Memory Processes Paradigm: Content, Temporal Order, and Prospective Memory (Schmitter-Edgecombe et al., 2009). Prior to beginning a sequence of 10 neuropsychological tests (e.g., Trail Making Test, Boston Naming Test), participants were instructed that we wanted to see how well they could remember to do something in the future without being reminded. Following each of the 10 tests, participants were asked to rate how challenging they found the tests. Participants were told that this task-challenge rating would be their cue to ask the examiner for a pill bottle so that their friend could receive pain medication. *Prospective memory* was represented by the number of times that the pill bottle was correctly requested. After the final neuropsychological test, participants were then administered an unexpected free-recall task for the activities followed by the temporal order memory task. For the temporal order memory task, participants were instructed to arrange the order of 10 cards that contained descriptors of the activities into the order that they had completed the tasks. The number of correct activities recalled served as the measure of *activity content memory*. *Temporal order memory* was computed as the sum

of the absolute value of the difference between each test's remembered position and its actual position (Mangels, 1997).

Analyses

t-tests and ANCOVAs were used to compare the high and low SCC groups on neuropsychological and demographic variables. Measures (i.e., IADL-C) not normally distributed were log-transformed. To indicate the relative strength of significant group differences, effect sizes were calculated. Pearson's correlations were used to compare self- and informant-report IADL-C, as well as the questionnaire data with the neuropsychological measures. A more conservative significance value of $p < .01$ was used for the correlations due to the large number of comparisons being made.

Results

Participant characteristics

Table 1 shows the demographic and clinical characteristic comparisons of the high and low SCC groups. There were no significant differences between the groups in age, education, or general cognitive status (i.e., TICS). There was a higher proportion of females in the low SCC group compared to the high SCC group, $\chi^2(1) = 6.25$, $p < .05$. Forty-eight participants identified as Caucasian, one as American Indian/Alaskan Native, and one "other."

As seen in Table 1, the high SCC group self-reported a significantly higher mean number of depressive symptoms compared to the low SCC group, $t(49) = -2.30$, $p < .05$, $d = 1.42$. However, mean symptom report level for depression fell well within the normal range for both the high (T-Score = 48.29; $SD = 8.35$) and low SCC groups (T-score = 44.20; $SD = 7.38$). Given the negative influences that depression can have on one's self perception of abilities, depression was controlled for in subsequent analyses.

Neuropsychological data

Table 2 shows neuropsychological data for the two groups. Similar to most prior work (e.g., Nutter-Upham et al., 2008; Peter et al., 2014; Reisberg et al., 2010), there were no statistically significant differences between the high and low SCC groups on the neurocognitive measures, t 's < 1.55 , p 's $> .13$ (see Table 2). However, when looking qualitatively at the means, with the exception of the BNT, the high SCC group performed lower (although not significantly) on all neuropsychological tests.

Everyday functioning measures

Participant self-report—Summary data for the IADL-C is shown in Table 3. After controlling for depression, compared with the low SCC group, the high SCC group self-reported significantly more problems with everyday functioning as measured by the total IADL-C score, $F(1, 48) = 21.92$, $p < .001$, $d = 1.52$. Individuals in the high SCC group also rated themselves as having more difficulties in all subdomains after controlling for depression [money and self-management, $F(1, 48) = 21.71$, $p < .001$, $d = 1.47$; home and daily living, $F(1, 48) = 7.95$, $p < .01$, $d = .96$; travel and event memory, $F(1, 48) = 16.55$, p

< .001, $d = 1.21$; and social skills, $F(1, 48) = 6.66, p < .05, d = .88$] compared to the low SCC group.

Knowledgeable-informant report—Knowledgeable informants similarly reported significantly more problems with everyday functioning after controlling for depression for the high SCC group compared to low SCC group, $F(1, 33) = 4.43, p < .05, d = .79$. After controlling for depression, social skills, $F(1, 33) = 4.33, p < .05, d = .62$, was the one subdomain that, compared to the low SCC group, informants endorsed the high SCC group as having more difficulties with. No differences were found for the money and self-management, $F(1, 32) = 2.99, p = .09, d = .69$, home and daily living, $F(1, 33) = 2.59, p = .12, d = .54$, and travel and event memory, $F(1, 33) = 2.37, p = .13, d = .63$, subdomains. Of note, although not reaching statistical significance, the effect sizes for the money and self-management, and travel and event memory subdomains fell well within the medium range and were equivalent to the effect size of the social skills subdomain.

Correlations among self- and informant-report IADL-C—Pearson's correlations were used to compare participant self-report with informant-report scores on the IADL-C total score. For the high SCC group, the relationship between the self- and informant-reported total IADL-C scores was positive and statistically significant, $r = .57, p < .05$. In contrast, for the low SCC group, the self- and informant-reported total IADL-C scores were not significantly correlated, $r = -.09, p = .72$. Furthermore, there was a negative correlation suggesting discrepancies in self- and informant-report of everyday functioning for the low SCC group.

Correlations between cognition and everyday functioning

Next, we assessed for relationships between everyday functioning and memory, executive functioning, noncontent memory (i.e., prospective memory and temporal order memory), and cognitive constructs not expected to have as strong a relationship with everyday functioning (i.e., picture naming and processing speed). Given the large number of comparisons, we only considered correlations between neuropsychological measures and self- and informant-report total IADL-C scores and used $p < .01$ for significance.

For the high SCC group (see Table 4), the self-reported IADL-C total score correlated significantly with executive functioning (Trails B) and temporal order memory measures, while the informant-report IADL-C total score did not correlate with any neuropsychological measure at the $p < .01$ level of significance. In contrast, for the low SCC group, both self- and informant-reported IADL-C total did not correlate significantly with any neuropsychological tests.

Discussion

Early detection and diagnosis of asymptomatic individuals with higher risks for the development of cognitive impairment is an important goal of dementia research. Whereas the cognitive performances and psychosocial correlates of individuals with SCC have been actively studied, the functional abilities and complaints of individuals with SCC have been largely neglected. In this study, we compared self- and informant-report of everyday

functioning in HOAs who self-reported high and low levels of SCC, and examined cognitive correlates of self- and informant reported functional abilities in the high SCC group.

The study findings showed that, despite the intact nature of performances on neuropsychological tests and after controlling for depression, individuals who self-reported high levels of SCC also endorsed significantly more problems with everyday functioning compared to the low SCC group. Furthermore, informants similarly reported that the high SCC group was having significantly more difficulties with everyday functioning than the low SCC group after controlling for depression. A prior study by Rabin (2009) found that, compared to controls, individuals with SCC performed significantly poorer on a task that assessed everyday practical judgment and problem-solving skills. Our findings extend this research by showing that individuals with high SCC are self-reporting more difficulties with complex tasks of everyday living and further these changes in functional abilities are evident to informants.

Compared to the low SCC group, the high SCC group self-reported having greater difficulties in each of the four IADL-C subdomains. Although the only significant subdomain group difference to emerge for informants was social skills, effect sizes were similar to social skills for the money and self-management and travel and event memory subdomains. Both the high SCC group and their informants also endorsed the most notable difficulties in the subdomains of money and self-management, and travel and event memory. This mirrors findings from a recent study with the IADL-C which found that, relative to HOAs, individuals with MCI experienced the greatest difficulty with the IADL-C subdomain of money and self-management, followed by travel and event memory (Schmitter-Edgecombe et al., 2014). In contrast, HOAs showed the greatest difficulty with the travel and event memory subdomain (Schmitter-Edgecombe et al., 2014). Consistent with prior literature (Bangen et al., 2010; Schmitter-Edgecombe et al., 2014; Triebel et al., 2009), these findings indicate that there may be subtle functional changes that occur along the spectrum of cognitive decline. Our findings also suggest that money management skills (e.g., keeping financial records organized, managing a budget), as well as self-management abilities (e.g., prioritizing tasks, managing task interruptions, organizing and planning complex activities, completing tasks efficiently), may be affected earlier in the course of cognitive decline than other areas. Given that greater functional impairment in MCI has been associated with faster rates of subsequent cognitive and functional progression (e.g., Purser, Fillenbaum, Pieper, & Wallace, 2005) and increased rates of progression from MCI to dementia (e.g., Farias et al., 2013), it is likely that individuals with both SCC and functional difficulties are at greater risk for progression to MCI.

Consistent with much of the SCC literature (e.g., Peter, 2014), there were no significant group differences between the high and low SCC groups on any of the neuropsychological tests, although individuals with high SCC scored numerically lower on the majority of tests. This pattern of slightly lower performances by the high SCC group could reflect subtle cognitive changes that occur along the spectrum from normal aging to cognitive impairment. This is supported by the finding that several significant relationships emerged with hypothesized cognitive correlates. More specifically, poorer performances on tests of executive functioning (switching) and temporal order memory were related to poorer self-

reported everyday functioning for the high SCC group. This pattern of findings is consistent with the literature, which suggests that memory and executive functioning, are related to everyday functioning in the older adult population and MCI populations (e.g., Farias et al., 2009; Jefferson, Paul, Ozonoff, & Cohen, 2006; McAlister, Schmitter-Edgecombe, & Lamb, 2016; Schmitter-Edgecombe & Parsey, 2014b). Further examination of the cognitive domains that may predict functional performance in individuals with SCC and their neural underpinnings may serve to refine the neuropsychological profile of SCC and development of sensitive cognitive tests. The use of more ecologically valid functional-based cognitive measures (e.g., BADS, RBMT) may also be useful for capturing possible subtle cognitive changes in individuals with SCC.

Although future longitudinal studies are needed to better document the trajectory of individuals self-reporting high SCC but demonstrating generally intact performances on neuropsychological tests, these individuals should not simply be dismissed as the worried well. The moderate positive and significant correlation between self- and informant-report IADL-C for the high SCC group, along with the significant correlations between self-report IADL-C and executive abilities, suggests that individuals with SCC are aware of and are likely reliable reporters of changes in both their cognitive and functional abilities. However, the literature on SCC is complex with mixed findings, and other studies (e.g., Edmonds, Delano-Wood, Galasko, Salmon, & Bondi, 2014) have challenged the clinical utility of SCC particularly in individuals with MCI. Future research is needed with cognitively healthy older adults to examine whether gathering additional information on functional status from both the individual and an informant may assist in better understanding the nature and impact of subjective cognitive concerns and identifying individuals who are at high risk for progression to MCI or dementia.

Regarding study limitations, our sample of older adults was recruited from the community, predominantly Caucasian, highly educated, and reported low rates of depressive symptomology. Furthermore, the age of our sample of older adults ranged from 50 to 88. These factors may limit generalizability of our findings to other populations. This study is also limited by the small sample size, and future studies with larger samples will be needed to replicate the findings and further examine cognitive correlates of functional abilities in the SCC population. The lack of significant relationships between cognitive and functional status measures for the low SCC group may have been related to the restricted variability in both the cognitive and IADL-C measures for the low SCC group. Whereas these findings warrant replication with larger samples, other studies with larger groups of cognitively healthy older adults have also not shown strong relationships between cognition and everyday functioning (e.g., Giovannetti, Libon, Buxbaum, & Schwartz, 2002; Schmitter-Edgecombe, Parsey, and Cook, 2011). In addition, although there were no significant differences in education between the groups, there was a trend toward significance and a moderate effect size with the low SCC group being slightly more educated than the high SCC group. Future studies should consider whether cognitive reserve may play a role in an individual's perception of their cognitive status.

The lack of a general definition and methodology for characterizing SCC also hampers the comparability of results across studies, although a recent working group has begun to

establish a conceptual framework and criteria for subjective cognitive decline (SCD) in pre-MCI (Jessen et al., 2014). Although we consider our method of using a continuous severity measure of cognitive concerns to determine SCC a strength of our study, most studies categorize SCC as dichotomous responses based on one question about memory functioning. In addition, the questionnaire used in this study assessed a variety of cognitive concerns rather than focusing exclusively on subjective memory complaints. This is consistent with recent work suggesting that SCC be classified using questions assessing subjective decline in memory as well as nonmemory domains. (e.g., Amariglio, Townsend, Grodstein, Sperling & Rentz, 2011; Jessen et al., 2014). The current questionnaire also asked about symptoms that were present during the prior seven days. A seven-day reference period may be limiting and subject to a large amount of variability. For example, an individual with subtle cognitive decline but no noticeable change in the past week may experience a “new normal” regarding their cognitive functioning and rate their functioning accordingly. Further studies using questionnaires (e.g., IQCODE) assessing cognitive functioning over longer periods of time are needed as these may better help to ensure that transitory events (e.g., bereavement, sickness, stress, sleep) do not affect self- and informant-report of cognitive functioning. However, if participants’ cognitive complaints were related to transitory events (e.g., individuals with more transient cognitive difficulties were part of the high SCC group or those with prior cognitive concerns but experiencing fewer during the reporting period were part of the low SCC group), the likelihood of capturing the existence of observed functional impairments by both participant- and informant-report would be reduced making it more difficult to demonstrate the relationship found in this study. It is also possible that one may be more likely to endorse functional problems if he or she self-perceives cognitively problems, and informants’ report may reflect participant complaints rather than true difficulties. Also, the less one complains, the less evident functional difficulties may be to informants. Examination of whether informants with subjective cognitive complaints influence the likelihood that participants will also have complaints is also needed. We also acknowledge the inherent difficulties with using informant-report as they could be subject to reporter biases, and future studies should also employ performance-based measures.

Our data suggest that it will be important for future studies to investigate functional abilities and functional complaints in individuals with SCC, especially longitudinally, and this will require using everyday functioning measures sensitive enough to capture early and subtle changes in functional abilities. We found that, after controlling for depression, individuals with high SCC and their informants endorsed more everyday functional difficulties relative to a low SCC group. Furthermore, the cognitive domains of executive functioning and temporal order memory, which have both been linked to frontal lobe functioning, showed the strongest relationships to everyday functioning for the high SCC group. Identifying individuals most at risk for the development of dementia is needed, in part because of the opportunities for disease prevention and treatment. Taken together, our findings support the need for further investigation of SCC as a clinical concept (Jessen et al., 2014) along with assessment of functional abilities in individuals with SCC. Longitudinal assessment is also vital to determine whether those individuals with high SCC in addition to functional difficulties, especially if corroborated by a knowledgeable informant, may be at an even greater risk for the development of MCI and dementia.

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Table 1

Demographic Data for the Low and High SCC Groups

Variable or test	Low SCC		High SCC		<i>t</i> -test	<i>p</i>	Cohen's <i>d</i>
	<i>N</i> = 25		<i>N</i> = 26				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Age	67.72	8.36	66.81	10.46	.34	.73	.10
Range	55–87		50–86				
Education	16.80	2.27	15.42	2.86	1.90	.06	.53
Gender (% female)	85%		46%			.01	
Depression	10.60	3.85	15.42	2.86	−2.30	.03	1.42
TICS	35.61 ^a	2.19	34.61 ^b	4.13	1.03	.31	.30

Note. *M* = mean, *SD* = standard deviation. TICS = Telephone Interview for Cognitive Status, SCC = subjective cognitive concerns, Depression measured with 8-item Patient-Reported Outcomes Measurement Information System (PROMIS).

^a *n* = 23.

^b *n* = 23.

Table 2
Mean Summary Data for the Neuropsychological Measures for the Low and High SCC Groups

Test	Low SCC		High SCC		<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Memory						
MAS delayed prose	6.72	1.51	6.54	1.30	.46	.13
Activity memory content	7.56	1.56	6.89	1.56	1.55	.13
Executive function						
Trails B ^t	1.43	.70	1.74 ^a	1.00	-1.26	.22
CWIT ^t	62.44	21.86	63.38	16.43	-.18	.86
Noncontent memory						
Prospective memory	8.64	2.56	8.23	2.94	.53	.60
Temporal order memory ^t	14.16	8.81	15.69	6.42	-.71	.48
Neuropsychological						
Trails A ^t	29.92	10.98	30.52 ^a	10.50	-.20	.85
Boston Naming Test	57.56	2.18	57.65	2.04	.16	.87

Note. *M* = mean. *SD* = standard deviation. MAS = Memory Assessment Scale. CWIT = Color Word Interference Test. SCC = subjective cognitive concerns.

^a
n = 25.

^t
Higher scores represent poorer performance.

Table 3

Mean Summary Data for the IADL-C for the Low and High SCC Groups

IADL-C	Low SCC		High SCC		<i>F</i> -test	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Self-report total	.05	.05	.23	.16	21.92***	1.52
Money and self-management	.06	.07	.27	.19	21.71***	1.47
Home and daily living	.02	.06	.13	.15	7.95**	.96
Travel and event memory	.05	.06	.22	.19	16.55***	1.21
Social skills	.02	.08	.16	.21	6.66*	.88
KI-report total	.07	.08	.19	.20	4.43*	.79
Money and self-management	.07	.12	.21	.26	2.99	.69
Home and daily living	.04	.07	.11	.17	2.59	.54
Travel and event memory	.08	.10	.18	.20	2.37	.63
Social skills	.02	.07	.10	.17	4.33*	.62

Note. *M* = mean. *SD* = standard deviation. SCC = subjective cognitive concerns.

[†] Higher scores represent poorer performance.

Approaching significance, $p = .05$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Pearson Correlations between IADL-C scores and Neuropsychological Measures for the Low and High SCC Groups

Test	Low SCC		High SCC	
	Self-report total ^t	KI-report total ^t	Self-report total ^t	KI-report total ^t
Memory				
MAS prose memory	-.39	-.11	.01	-.16
Content memory	.19	.20	-.45	-.39
Executive function				
Trails B ^t	.25	-.24	.45	.50
CWIT ^t	-.13	.06	.58 [*]	.49
Noncontent memory				
Prospective memory	.15	-.06	-.18	-.45
Temporal order memory ^t	-.20	-.12	.51 [*]	.52
Neuropsychological				
Trails A ^t	-.17	-.06	-.08	.11
Boston Naming Test	-.23	-.02	.06	-.07

Note. MAS = Memory Assessment Scale. CWIT = Color Word Interference Test. IADL-C = Instrumental Activities of Daily Living: Compensation Scale. KI = knowledgeable informant. SCC = subjective cognitive concerns.

^a
n = 25.

^b
n = 17.

^t Higher scores represent poorer performance.

^{*}
p < .01.