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# Assessing Adult Leisure Activities: An Extension of a Self-Report Activity Questionnaire

**Daniela Jopp** and **Christopher Hertzog**
School of Psychology, Georgia Institute of Technology, 654 Cherry St., Atlanta, Georgia, 30332-0170

## Abstract

Everyday leisure activities in adulthood and old age have been investigated with respect to constructs such as successful aging, an engaged lifestyle, and prevention of age-related cognitive decline. They also relate to mental health and have clinical value as they can inform diagnosis and interventions. In the present study, we enhanced the content validity of the Victoria Longitudinal Study activity questionnaire by adding items on physical and social activities, and validated a shortened version of the questionnaire. Our proposed leisure activity model included 11 activity categories: three types of social activities (i.e., activities with close social partners, group-centered public activity, religious activities), physical, developmental, and experiential activities, crafts, game playing, TV watching, travel, and technology use. Confirmatory factor analyses validated the proposed factor structure in two independent samples. A higher-order model with a general activity factor fitted the activity factor correlations with relatively little loss of fit. Convergent and discriminant validity for the activity scales were supported by patterns of their correlations with education, health, depression, cognition, and personality. In sum, the scores derived from of the augmented VLS activity questionnaire demonstrate good reliability, and validity evidence supports their use as measure of leisure activities in young, middle-aged, and older individuals.

### Keywords

Activity; Lifestyle; Self-report; Aging; Engagement

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Preferences for and execution of specific activities are important features of everyday human life. Assessment of activities is therefore essential for various clinical diagnoses. For instance, a reduction in voluntary activities can be symptomatic of depression or chronic fatigue, whereas excessive activity is associated with Attention Deficit/Hyperactivity disorders (American Psychiatric Association, 2000). Specific activities can also provide complementary information further clarifying clinical diagnosis (e.g., assessment of Type A in depressive patients; Barefoot et al., 1990) and permit clinicians to develop a more complete profile of the patient's behavior (e.g., for patients with mild cognitive impairment or Alzheimer disease; Perneczky et al., 2006; Shoval et al., 2008). In addition, activity measures have clinical utility by informing the design of suitable interventions and aiding the assessment of activity changes related to recovery (e.g., Tryon, Tryon, Kazulausky, Gruen, & Swanson, 2006).

E-mail concerning this paper can be addressed to jopp@fordham.edu or christopher.hertzog@psych.gatech.edu. More information on research in the Hertzog laboratory can be obtained at http://psychology.gatech.edu/CHertzog/.
Dr. Jopp is now at Fordham University, Bronx, NY

Activities have also received substantial attention in the context of aging. An active life style is considered as essential for aging well (e.g., Rowe & Kahn, 1998): Engaging in stimulating leisure activities has been linked to higher levels of well-being and lower levels of depression in old age (e.g., Herzog, Franks, Karkus, & Holmberg, 1998; Lampinen, Heikkinen, Kauppinen, & Heikkinen, 2006; Menec, 2003), good physical health and independent functioning (e.g., Keysor & Jette, 2001; Schroll, 2003; Prohaska et al., 2006), and relative preservation of cognitive functioning (e.g., Bosma et al., 2002; Hultsch, Hertzog, Small, & Dixon, 1999; see Hertzog, Kramer, Wilson, & Lindenberger, 2009, for a review).

Early theories of successful aging argued for a central role of engagement in life, emphasizing the benefits of a high overall activity level (Havighurst, Neugarten, & Tobin, 1968) and of continued activity into old age (Atchley, 1986). Other theories focused on specific activity types, such as linking social activities to well-being, health, and longevity (Lawton, 1994; Lawton, Moss, Winter, & Hoffman, 2002; Maier & Klumb, 2005; see Seeman & Crimmins, 2001, for a review). There are multiple pathways by which an active life style can benefit adult cognition (Hertzog et al., 2009), including the investment of time and effort to acquire new knowledge (e.g., Ackerman, 2000); the practice-related strengthening of the cognitive processes involved in an activity; and the benefits of physical exertion, especially aerobic exercise, on brain functioning (e.g., Colcombe & Kramer, 2003). The pathways by which activities benefit functioning can be relatively general and global, but can also be quite specific to the type of activity and the type of function involved. Thus, capturing the benefits of leisure activities requires differentiating the effects of a generically active life-style from the effects of specific activities for different psychological outcomes such as mental health or cognition.

Hultsch, Hammer, and Small (1993) developed the Victoria Longitudinal Study (VLS) activity questionnaire to assess multiple activities. Hultsch et al. (1999) organized VLS activity items into the scales: physical, social, self-maintenance, passive information processing, integrative information processing, and novel information processing. The latter scale assessed intellectually stimulating activities such as doing crossword puzzles and reading, and it predicted rates of cognitive decline in older adults in the VLS (Hultsch et al., 1999). Jopp and Hertzog (2007) subsequently offered an alternative factor model of the VLS activity questionnaire that scaled the items into physical activities, crafts, games, TV watching, social activities, technology use, developmental activities, and experiential activities. They showed that a general activity factor predicted cognition and self-rated memory function in an adult lifespan sample.

## The Present Study

The broad goal of the present study was to expand the VLS activity questionnaire to create a measure of adult leisure activities that (a) is of moderate length, (b) has a replicable item factor structure, (c) is applicable for measuring leisure activities across the adult life span, (d) is appropriate for inclusion in models that seek to estimate both a higher-order active life-style factor and specific activities, and (e) addresses content validity issues of the VLS scales.

Regarding content validity, we sought to better represent the breadth of adult leisure activities via enhanced measurement of physical and social activities. The original VLS questionnaire assesses only a few physical activities, including one generic item about exercise. We created new items addressing additional forms of exercise such as aerobics, flexibility training, and strength training. The VLS questionnaire also omits some potentially important types of social activity (e.g., talking on the phone). We constructed new items that allowed for a distinction between private social activities, public social activities, and religious activities.

We evaluated the factor structure of activity items and the construct validity of specific activity scales in two samples. Our assessment of construct validity involved looking at the correlational

patterns of specific activity scales with variables such as education, health, cognition, depression, personality, and age. Although we expected correlated activity dimensions, given the presence of a general active life style, we also expected divergent patterns of correlations of activities with other variables. For example, we expected that cognitively demanding activities such as technology use would relate most strongly to cognitive functioning (Jopp & Hertzog, 2007) and that physical activities would be reliably linked to health, given benefits of exercise and fitness on health status. Additional specific activity-outcome relations are discussed below.

## Method

### Participants

**Study 1—**The sample consisted of 267 individuals aged 18 to 82 years old ($M_{Age}$= 49.58, *SD* = 17.32; see Table 1). Stratification for age and gender resulted in almost equal numbers per age decade (i.e., 38 to 53 persons) and gender (men: 46%). Sample participants included 62% Caucasians, 31% African Americans, 5% Asians, and 3% other ethnicities. Participants were recruited via advertisement in local newspapers and television inviting them to a study on beliefs about aging, and were paid for participation. After 16.4 months (*SD* = 1.5), we enrolled 50% of the original sample in a retest study to determine test-retest reliability of the activity scales. This percentage was lower than expected because a large number of participants had relocated.

**Study 2—**The sample consisted of 218 participants aged 19 to 81 years ($M_{Age}$= 51.66 years, *SD* = 23.43; men: 45%). The design included two age groups, a young group aged 19 to 26 (*n* = 81, $M_{Age}$= 21.73 years, *SD* = 2.09; men: 53%) and an older group aged 57 to 81 (*n* = 137, $M_{Age}$= 69.35 years, *SD* = 4.94; men: 39%). The total sample contained 72% Caucasians, 25% African Americans, 3% Asians, and 0.5% other ethnicities (no information: *n* = 2). Participants were recruited by ads in local newspapers and television and were paid for their participation.

### Measures

**Leisure activities—**Activities were assessed with an extended version of the VLS activity questionnaire. Originally, the VLS questionnaire included 70 short activity descriptions. Individuals indicated the frequency of each activity on a 9-point Likert-like scale with the response options: 0 = *never*, 1 = *less than once a year*, 2 = *about once a year*, 3 = *2 or 3 times a year*, 4 = *about once a month*, 5 = *2 or 3 times a month*, 6 = *about once a week*, 7 = *2 or 3 times a week*, and 8 = *daily*. We extended the questionnaire by adding a total of 12 items, including seven physical and five social activities. The new physical activity items were: aerobics (e.g., cardiovascular exercise, fitness training, workout); flexibility training (e.g., stretching, yoga, tai chi); weight lifting; strength training or calisthenics; walking (e.g., around the block, in the mall, in lieu of driving); swimming; bicycling; and dancing (e.g., swing, ballroom, jazz, country). The new social activities were: talk to friend on the phone; go out with friend; attend a party; attend an organized social event (e.g., at the senior center, fraternity events, church social groups); and engage in political activities (e.g., neighborhood organization, environmental club).

**Correlates—**Education was measured by the number of years attending school, college, and university. Health restrictions were assessed by combining three indicators. First, participants evaluated their health status on a 5-point Likert-like scale (1 = *excellent* to 5 = *poor*). Second, functional health-related activity limitations were assessed by summing six items asking how health issues had affected various activities during the past 3 years (i.e., doing chores, getting around town, mental recreation, physical recreation, hobbies, travel; 1 = *strongly positively*, 7 = *strongly negatively*; see Hultsch, Hertzog, Dixon, & Small, 1998). Third, medication intake

was assessed by a list of 30 medications (0 = *no*, 1 = *yes*). All health restriction variables were standardized and combined into a unit-weighted composite (higher value = more restriction).

Depressive affect was measured by combining the Well-Being and Depressive Affect subscales of the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Given the potential overlap between health indicators and physical symptoms assessed in the CES-D, we selected those scales free of health-related items, resulting in a more pure measure of depressive affect (e.g., Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990). Personality was measured (in Study 2 only) by the Revised NEO Personality Inventory (NEO PI-R, Form S; Costa & McCrae, 1992), assessing neuroticism, extraversion, openness to experience, conscientiousness, and agreeableness (240 items; 1 = *strongly disagree*, 5 = *strongly agree*).

Cognition was measured by a set of fluid abilities which are well-know to show age-associated loss (i.e., perceptual speed, inductive reasoning, associational fluency, and episodic memory) and one crystallized ability which is rather stable across the adulthood (i.e., verbal comprehension; Carroll, 1993). Both studies used similar, but not identical, psychometrically sound and well established tests. *Perceptual speed* was evaluated with the Pattern Comparison and Letter Comparison tests (Salthouse & Babcock, 1991); Study 2 added Digit Letter Substitution (Wechsler, 1981). *Inductive reasoning* was measured by Letter Sets (Ekstrom, French, Harman, & Dermen, 1976), and Raven's Progressive Matrices (Raven, 1958); Study 2 added Letter Series (Thurstone, 1962). *Associational fluency* was assessed by Topics and Opposites (Ekstrom et al, 1976); Study 2 added Themes (Ekstrom et al., 1976). To assess *episodic memory*, Study 1 used the First-Last-Name test (Ekstrom et al., 1976) and two new verbal associative memory tasks: a paired-associate test with 40 pairs of unrelated, concrete nouns (e.g., DOG-SPOON), and another with 30 unrelated and 30 associatively related pairs. In Study 2, episodic memory was assessed with the First-Last-Name test. Study 2 also included two working memory tests, Computation Span and Listening Span (Salthouse & Babcock, 1991). *Verbal comprehension* was measured by the Shipley Vocabulary Test (Zachary, 1986) and the Multidimensional Aptitude Battery (MAB) Comprehension Test (Jackson, 1984); Study 2 added the MAB Information Test (Jackson, 1984).

## Results

### Item Reduction and Exploratory Factor Analyses

Our first step was to reduce items with poor statistical properties. We excluded instrumental activities of daily living (i.e., prepare a meal, housework, food shopping) that often generate little variance in healthy samples. We also excluded seven items (i.e., taking a bus, taking care of a pet, or caring for a disabled family member) that had low correlations with other activities. To avoid extreme marginal distributions, we also excluded rarely endorsed items (singing in choir, computer programming, preparing somebody else's taxes, attending correspondence course), and one typically endorsed item (drive a car). Two more items were excluded due to extreme skewness (i.e., balancing checkbook, listening to radio). All these exclusions had been performed for the same reasons by Jopp & Hertzog (2007).

Subsequently, we used a two-stage factor-analytic approach to determine the underlying structure of the questionnaire. Based on the findings of an initial exploratory factor analysis, we dropped nine items, either because their loadings were below .20 on any factor or because they had indeterminate, split loading patterns on multiple factors. We then tested the solution for the reduced VLS activity item set with confirmatory factor analysis.

### Confirmatory Factor Analysis

A set of 57 activity items was used for the final model (Table 2). The model specified 11 activity factors: Physical Activities, Games, Crafts, Watching TV, Social-Private, Social-Public, Religious, Developmental, Experiential Activities, Technology Use and Travel. The fit of the confirmatory model based on the exploratory solution yielded an acceptable model fit, $\chi^2$ ($N$ = 267, $df$ = 1484) = 2796.69, $p < .001$, $\chi^2/df$ = 1.89, RMSEA = .058, CI = .054–.061, IFI = .94, TLI = .94, CFI = .94. Closer model inspection suggested allowing the item "attending organized social events" to load on both the originally targeted Social-Public factor and the Religious Activity factor. Adding this loading improved the model significantly, $\Delta\chi^2 = 52.47$, $\Delta df = 1$, $p < .001$, resulting in the following fit, $\chi^2$ ($N$ = 267, $df$ = 1483) = 2744.22, $p < .001$, $\chi^2/df$ = 1.85, RMSEA = .057, CI = .053–.060, IFI = .94, TLI = .94, CFI = .94. Other changes were not required.

The standardized factor loadings from the final model are reported in Table 2. All factors were well defined and most of the loadings were above .35. Out of the 57 items, however, seven had lower loadings (with one as low as .18, the others ranging between .24 to .34). In order to define the activity dimensions as broadly as possible, we retained items with modest loadings. Only three of the newly created specific physical activity items remained in the solution reported in Table 2, namely "weight lift, strength, calisthenics", "aerobics (cardio, fitness, workout)", and "flexibility (stretching, yoga, tai chi)". We had tested two more models that used all new items plus some of the three original VLS items (exercise, recreational sports, outdoor). Comparing the fit indices did not reveal advantages of including all of the specific exercise items.[1]

Study 2 data were used to validate the factor structure established in Study 1. The model fit was good, $\chi^2$ ($N$ = 218, $df$ = 1483) =2748.96, $p < .001$, $\chi^2/df$ = 1.85, RMSEA = .063, CI = .059–.066, IFI = .93, TLI = .92, CFI = .92. The standardized factor loadings are reported in Table 2. For the most part, the loadings were well replicated. Minor differences between samples were detected for Watching TV, Technology Use, and Experiential Activities regarding the absolute loading size, but the model developed in Study 1 was successfully validated in Study 2.[2]

Activity factor correlations were mostly significant, but there was a substantial variation (Table 3). The correlations ranged in Study 1 from −.19 to .61, with a median correlation of .20, and in Study 2 from −.31 to .73, with a median correlation of .16, $p$s < .05. Closer inspection showed theory-conform patterns (e.g., with moderate correlations among several factors). As an exception, religious activities only correlated with a few other factors.

In a final model, we tested whether a higher-order activity factor could account for the correlations among the 11 activity factors (see Jopp & Hertzog, 2007). Given the cross-sectional samples and age differences in patterns of activity, we added chronological age to

[1]Although we did only included a selection of physical activity items in the final model, using more items may be beneficial if a stronger focus on physical activity is intended. Both models, the one with 9 items (i.e., three VLS items "exercise", "outdoor", and "recreational activities" and six new items "weight lifting", "aerobics", "flexibility", "walking", "swimming", "biking") and the one with 8 (i.e., two VLS items "outdoor", and "recreational" and six new items "weight lifting", "aerobics", "flexibility", "walking", "swimming", "biking"), provided good fits (9 items: $\chi^2$ ($N$ = 267, $df$ = 1654) = 3085.01, $p < .001$, $\chi^2/df$ = 1.87, RMSEA = .057, CI = .054–.060, IFI = .94, TLI = .93, CFI = .94; 8 items: $\chi^2$ ($N$ = 267, $df$ = 1596) = 2976.34, $p < .001$, $\chi^2/df$ = 1.87, RMSEA = .057, CI = .054–.060, IFI = .94, TLI = .93, CFI = .94. Loadings of the specific items on the physical factor were (9 items, 8 items): weight lifting: .77, .75; aerobics: .73, .67; flexibility: .54, .33; outdoor: .55, .58; recreational: .55, .54; walking: .39, .33; swimming: .25, .28; biking: .34, .38; and exercise (9 items only): .56. Scale reliability was (9 items, 8 items): Total sample: .77, .78; young: .83, .80; middle-aged: .78, .75; and older: .70, .67.

[2]We also tested models with 8 and 9 physical activity items, replicating Study 1. The fit of both models was good (9 items: $\chi^2$ ($N$ = 218, $df$ = 1654) = 2987.76, $p < .001$, $\chi^2/df$ = 1.81, RMSEA = .061, CI = .057–.064, IFI = .93, TLI = .92, CFI = .93; 8 items: $\chi^2$ ($N$ = 218, $df$ = 1596) = 2847.13, $p < .001$, $\chi^2/df$ = 1.78, RMSEA = .060, CI = .057–.064, IFI = .93, TLI = .92, CFI = .93). Factor loading were (9 items, 8 items): weight lifting: .60, .57; aerobics: .58, .50; flexibility: .52, .47; outdoor: .60, .64; recreational: .58, .63; walking: .32, .27; swimming: .49, .45; biking: .41, .44; and exercise (9 items only): .46. Reliabilities were (9 items, 8 items): Total: .75, .73; young: .78, .74; and older: .72, .68.

the model as a covariate. A measurement model including the 11 factors and age fit somewhat worse than the measurement model (Study 1: $\Delta\chi^2 = 118.28$, $\Delta\ df = 46$, $p < .001$; Study 2: $\Delta\chi^2 = 115.79$, $\Delta\ df = 46$, $p < .001$), showing some specific age differences in activity items not accounted for by the 11 factors. However, the overall fit was still adequate (Study 1: $\chi^2$ ($N$ = 267, $df$ = 1529) = 2862.50, $p < .001$, $\chi^2/df = 1.87$, RMSEA = .057, CI = .054–.060, IFI = .94, TLI = .94, CFI = .94; Study 2: $\chi^2$ ($N$ = 218, $df$ = 1529) = 2864.75, $p < .001$, $\chi^2/df = 1.87$, RMSEA = .063, CI = .060–.067, IFI = .93, TLI = .92, CFI = .93), so we used it as the baseline for evaluating the hierarchical factor model. We then specified a model with a single higher-order factor that was predicted by age, also allowing paths from age to the specific factors Watching TV, Developmental, Experiential, Social-Public, and Religious Activities. We further added four correlated residuals to the model, given appreciable modification indices (Social-Private: attend club meetings and attend organized events; Social-Public: attend parties and give dinner parties; Physical: outdoor activity and recreational sports; Games: crossword puzzle and jigsaw). Otherwise the general activity factor was forced to account for the correlations among the 11 activity factors. This hierarchical model did a reasonable job of accounting for the correlations given acceptable solutions in both samples (Study 1: $\chi^2$ ($N$ = 267, $df$ = 1574) = 2895.48, $p < .001$, $\chi^2/df = 1.84$, RMSEA = .055, CI = .053–.059, IFI = .94, TLI = .94, CFI = .94; Study 2: $\chi^2$ ($N$ = 218, $df$ = 1574) = 2892.80, $p < .001$, $\chi^2/df = 1.84$, $p < .001$, RMSEA = .062, CI = .059–.066, IFI = .93, TLI = .92, CFI = .93).

Figure 1 shows the standardized factor loadings of the 11 activity factors on the second-order factor in both samples. The loadings were in general reliably greater than zero. The factor was broadly defined, with the higher loadings on the Experiential, Developmental, Technology Use, Travel, Social-Private, and Social-Public factors. Age was negatively related to the general activity factor but positively related to several specific factors controlling on the negative relationship to the general activity factor.[3] The age differences in these specific factors were smaller or even in opposite directions from the general factor. This pattern illustrates that a single higher-order activity factor does not capture all relationships of activity to other variables.

In sum, findings supported the factorial validity of the multiple activity factors for the VLS questionnaire proposed by Jopp and Hertzog (2007). The addition of physical activity items improved the measurement of that dimension substantially by adding only a small number of items. The addition of social activity items resulted in a new subdivision of social activities in three new factors: private, public, and religious social activities. Interrelations between activity factors were mostly significant. These correlations can be used as the basis for specifying a higher-order activity factor, although specific activity factors may differ in their relationships to other variables, as was the case with age in the hierarchical models. Given that our major goal was to evaluate differences between specific activity factors' relationships to other variables the following analyses focus on the 11 activity scales rather than the general activity factor.

## Reliability

We computed summative scales for each activity dimension based on the confirmatory factor solution. Table 4 reports internal consistency estimates of reliability (Cronbach's alpha), a lower-bound estimate of true reliability (McDonald, 1999). In general, reliabilities of the scores were acceptable to good for both samples. The scores of the Travel scale had low internal consistency in both studies, in part because the scale only had three items. The scores of this scale also produced age differences in internal consistency. The same was true for the TV scale

[3]The high relation of age to experiential activities is likely to be caused by the extreme ages (i.e., young and old individuals) in Sample 2.

scores which produced low alphas for the older adults. Age-comparative findings for travel and TV items should be interpreted cautiously. Internal consistency was also not high for Experiential Activities and Technology Use scales scores.

Test-retest reliability of the scores derived for the activity scales was computed using the 16-month follow-up data for Study 1 (Table 4). Test-retest correlations were all reliably greater than zero and ranged from acceptable to good, ranging from $r = .61$ (TV scale) to $r = .82$ (Games scale). The only exception was a lower coefficient for the Travel scale score ($r = .41$). Besides poor values for the Travel score, four more coefficients were poorer than desired when splitting the sample by age group (scores for Physical and Social-Private for the young, Social-Public for middle-aged, and TV for the older), which may be related to more heterogeneous functions of these activities at these ages. In comparison to the Cronbach's alphas, the test-retest reliabilities were substantially higher for several scale scores, underscoring that internal consistency indices often underestimate scale reliability. Even these test-retest coefficients underestimate true reliability of the scale scores when there are reliable individual differences in activity change, which could be the case over the 16-month interval. Thus, the results indicated good psychometric properties of the scores of the leisure activity scales based on the item factor solution.

## Construct Validity

Correlations between activity scales and other variables, including cognition, are reported in Tables 5 (Study 1) and 6 (Study 2). The correlational pattern created a multidimensional picture of convergent and discriminant validity of the scores of the activity scales. As expected, Technology Use had the strongest positive relations to all cognitive abilities, with median correlations of .46 (Study 1; range: .35–.55) and .40 (Study 2; range: .26–.50). Developmental Activities also showed substantive relations to cognition in both studies, but correlations were somewhat smaller (median correlations, range: .32, .08–.39; .29, .02–.35). Interestingly, Developmental Activities had no relationship to crystallized intelligence. Physical Activities had weak to moderate correlations with some fluid facets of cognition (median correlations, range: .20, .18–.25; .24, .03–.26), but no link to crystallized abilities. A comparable pattern was found for the Games scale. Crafts had no relation to memory and speed and a weaker relation to general intelligence. For social activities, only Private Activities correlated positively with fluid abilities (median correlations, range: .15, .10–.24; .31, .18–.37), but had no relation to crystallized intelligence, and Public Activities did not correlate with any cognitive ability. Religious Activities had weak, negative relations to multiple cognitive abilities (median correlations: –.24; –.19). Furthermore, there were significant negative relations for the Experiential Activities scale with cognitive abilities (median correlations: –.10; –.31). Some correlations were stronger in Study 2 compared to Study 1, possibly due to age groups used in Study 2, as outlined below.

Higher levels of education correlated with Technology Use, Developmental Activities, and Experiential activities. (Correlations with education were not computed for Study 2 given the sample composition contrasting young vs. older adults). As expected, depressive affect correlated negatively with experiential and social activities, and health restrictions correlated negatively with Physical Activities, Developmental Activities, and Technology Use.

Correlations of activity scales with chronological age were mixed in magnitude and in sign. In both studies, chronological age was associated with lower levels of Physical Activities, Technology Use and Developmental Activities, whereas Experiential Activities were positively associated with age. Differences between studies emerged for Games, TV, and Social-Private Activities, which were significantly related to age only in Study 2.

Given differences in age composition in both studies and the findings that age covaried with the level of reported activity, we also computed partial correlations controlling for chronological age (Tables 5 and 6, numbers in parenthesis). For Study 1, correlations between Physical, Religious and Developmental Activities and cognition were reduced to some extent; they still were significant and moderate in size for Religious (median correlation: –.18) and Developmental Activities (.18), but rather weak for Physical Activities (.13). Notably, the correlations between Experiential Activities and cognition changed from negative to positive (median correlation: .11). In contrast, the relations between Technology Use and cognition were only minimally reduced (median correlation: .42). For education, controlling for age increased the correlations, especially for Technology Use and Developmental Activities. Correlations with depressive affect changed little, except for Physical Activities, resulting in a stronger negative relationship. The link between Technology Use and health restrictions disappeared.

As Study 2 included young and older adults only, we expected that the influence of age on these correlations would be increased. This was indeed the case. Controlling for age reduced the correlations that had been stronger in Study 2 compared to Study 1, such as between Social-Private Activities and cognition (median correlation: .09), resulting in parallel findings in both studies. Also replicating Study 1, the correlations between Experiential Activities and cognition changed from negative to positive when controlling for age (median correlation: .14). The links of Technology Use to cognition remained substantial (median correlation: .38).

**Personality correlates—**Correlations of the NEO personality scales and leisure activities were examined in Study 2 (Table 7). Overall, most significant relationships were found between activities and agreeableness, which negatively correlated with crafts, physical and developmental activities, and positively correlated with TV watching, public social and religious as well as experiential activities. Openness to Experience correlated most strongly with Developmental Activities and Technology Use; weaker relations existed with Games (positively) and TV and Religious Activities (negatively). The other personality scales had less clearly expressed patterns. As expected, individuals high on extraversion performed more private social activities and traveled more. Individuals high on conscientiousness reported more physical, religious and experiential activities, and more TV watching. Individuals high on neuroticism indicated less experiential activities. Controlling for age did not greatly alter the relations between activities and personality.

Each NEO scale is composed of multiple sub-facet scales (Costa & McCrae, 1992). Without reporting results in full detail, we note that in some cases facet scales' correlations with activity varied between the facet scores of the same Big-5 factor (correlations of the NEO facet scales are available upon request). In particular, for Openness to Experience, the Ideas facet (i.e., measuring a general disposition to engage in educational and intellectually challenging activities) correlated much more strongly with Developmental Activities, Games, and Technology Use ($r$ = .38, .35, and .39, respectively, $p < .01$) than did other Openness facet scales. Moreover, Ideas did not correlate substantially with other activity scales (e.g., any kind of social activities) replicating results from Hultsch et al. (1999) on the potency of Ideas for predicting their Novel-Information Processing scale (i.e., intellectually stimulating activities, broadly defined). In the present study, Ideas also correlated more strongly with cognitive abilities (e.g., $r$ = .47 with fluid intelligence, $p < .01$) than did other facets of openness. As another example, the Values facet score correlated $r$ = –.45 ($p < .01$) with religious activities, but not with other activity scales.

## Discussion

Our validation of the augmented VLS activity questionnaire was generally successful. The proposed factor structure fit the empirical data well. Internal consistency of the scores derived from the activity scales was adequate, and test-retest correlations suggested substantial reliability and stability of the scores. Although further validation is desirable, we consider this multidimensional measure of an engaged life-style to be ready for further use in empirical work.

### Value of the New Physical and Social Activity Items

The augmented physical activities scale produced stronger relationships with cognition and health compared to earlier work with the original VLS questionnaire (Jopp & Hertzog, 2007). This effect was accomplished by adding only three new items, “weight lifting”, “aerobics”, and “flexibility training.” With the expanded item set, the Physical Activity factor had substantially higher factor loadings, and the improved measurement of the construct allowed reliable correlations with other variables of interest. There is, however, the option to include more than just the physical activity items used in the final model. Because reliable factor patterns were also found when including all new physical activity items (see Footnotes 1 and 2), selection of physical activity items could be flexible, given the goals of the study. If investigating physical activities is the focus, it may be beneficial to include all the physical items to gain a better estimate of diverse exercise activities. When focusing on general activity patterns, using the reduced set of exercise items (as reported in the main text) has the advantage of shortening the questionnaire without compromising reliability or validity of its scales scores. Further evaluation of the degree to which self-reported frequency of physical exercise predicts long-term outcomes in adulthood, such as mental health, physical morbidity and mortality, is warranted.

The addition of items in the social domain allowed us to estimate three separate subscales of social activities: private, public, and religious. Separation of private and group-focused activities is an important feature of the present activity questionnaire, since it could help disentangle the mechanisms involved in linking social activities to successful aging outcomes. In line with prior evidence (e.g., Bosma et al., 2002; Fratiglioni et al., 2004; Zunzunegui, Alvarado, Dekl Ser, & Otero, 2003), social activities had significant associations to cognitive indicators. Maier and Klumb (2005) showed that time spent with friends was related to survival, whereas social activities per se were not. Parallel to their results, we also found private social activities to be important (e.g., for cognition), but no effect for public activities. Given that public social activities are likely to be more cognitively challenging than private social activities, and given that more cognitively gifted individuals are likely to engage more often in public social activities, we expected a stronger link between public rather than private social activities.

The fact that private activities alone were linked to cognition was unexpected, and represents an intriguing outcome that merits further investigation. Several explanations are possible. It could indicate that one-to-one exchange or solution of interpersonal conflicts may provide a specific cognitive training. It could also indicate that the emotional reward experienced in close interpersonal interactions has positive benefits for cognition. Seeman et al. (2001) found that social support, but not social ties, was related to better cognitive functioning. It may also be the case that positive reinforcement, social embeddedness, and emotional support contribute to better cognitive performance by indirect pathways via self-efficacy or self-esteem.

The relationships between private social activities and cognition may have been revealed in part due to the separation of public and religious activities. These activity types had been combined in the original VLS. We found negative correlations between religious activities and

cognition, in all likelihood reflecting a tendency toward avoiding organized religion by more intelligent, highly educated individuals. This is especially important because including items on religious activities in a general social activities factor will reduce the positive link between social activities and cognition. Public social activity items also are likely to dampen the relation between social activities and cognition given their lack of effect. Therefore, separating these three activity types that are often collapsed into one single construct seems potentially fruitful.

Our three social activity scales also manifested different patterns of correlations with personality, further supporting the argument that they measure different aspects of activity. These patterns were also explicable from prior literature. For example, agreeableness correlated reliably with self-reported attendance of religious services and prayer, consistent with findings that agreeableness predicts religiosity and its development (e.g., McCullough, Enders, Brion, & Jain, 2005; Wink, Ciciolla, Dillon, & Tracy, 2007). Extraversion showed the largest associations with social activities involving family and friends. This is in line with work by Finn (1997) who reported that individuals high in extraversion and agreeableness preferred activities such as conversation rather than exposure to mass media, including print and television.

## General Versus Specific Activities

The separation of social activities from other kinds of activities may be important for understanding whether a broadly engaged life style or specific kinds of activities contribute to age changes in cognition across the adult life span (Hertzog et al., 2009). One of the major advantages of the augmented VLS activity questionnaire is that it allows estimating general active life style and specific activities simultaneously, which can be used to evaluate whether general activity level or specific activity dimensions are the proper locus of prediction. In previous work, we used this approach to show a strong link of a general activity factor to a general cognition factor, while estimating specific activity-cognition effects at the same time (Jopp & Hertzog, 2007). The present results show that a hierarchical factor model fits the augmented VLS activity scales, opening the door for addressing research questions regarding whether the locus of activity effects are general or domain-specific. The potential value of separating general and specific activities can also be illuminated by results from Lövdén, Ghisletta, and Lindenberger (2005). They found that changes in older adults' social activities predicted changes in perceptual speed. However, their social activity construct included items that would be assigned to different scales in our taxonomy (e.g., developmental activities, travel), posing the question whether their effect was actually caused by social activity per se. A hierarchical modeling approach could disentangle whether the effects are due to a higher-order general active life style or specifically to social participation.

## Construct Validity of Activity Scales

The present investigation contributes to the process of building a nomological net (Cronbach & Meehl, 1955), supporting the argument that the self-reported activity scales do assess aspects of an engaged lifestyle by showing meaningful variation in activity scale correlations with other psychological constructs. The correlations observed between crafts, games, TV, technology use, experiential, and developmental activities and cognition replicated findings from Jopp and Hertzog (2007). Cognitively demanding activities such as technology use were most strongly related to cognitive functioning (Ackerman & Heggestad, 1997; Hultsch et al., 1999). Physical activities were most strongly related to health restrictions, with and without control for age, which was in line with investigations on health practice effects (e.g., Prohaska et al., 2006). Also consonant with our expectations and findings from Lawton et al. (2002), private social activities had the strongest relation to depression, suggesting that social engagement protects against depression or that people with higher depressive affect avoid social activities.

TV watching had negative correlations with cognition, a finding in line with ideas about the types of activities that should lead to cognitive enrichment (Hertzog et al., 2009). For instance, Lindstrom and colleagues (2005) reported that each additional hour of TV watching in middle age was related to a 30% increase in the risk to develop Alzheimer's disease in older age.

Chronological age was linked to reduced levels of physical activities, consistent with reports on the reduction of sports activities with advancing age (e.g., Prohaska et al., 2006). Developmental activities were also negatively related to age, which paralleled earlier findings on the reduction of developmental interest in advanced age. Experiential activities were, by contrast, positively related to age (Jopp & Hertzog, 2007). As expected, technology use, developmental and experiential activities were closely related to education, indicating that individuals with more advanced educational background engage more in these three types of activities.

## Clinical Application of the New Questionnaire

The expanded VLS activity questionnaire could be helpful in various ways for clinical assessment, including (a) the provision of complementary information for clinical diagnosis, (b) enhancement of interventions, and (c) prediction of clinical conditions. Determining levels of functional autonomy in elderly patients is of clinical value in many situations, but measures of activities of daily living are not informative for individuals with higher levels of functioning. A more fine-grained activity measure may help to detect limitations in routine activities in more highly functioning individuals, which are related to depression (e.g., Williamson, 1998). Older adults with fear of falling were also found to restrict their overall activities level, which can have detrimental consequences including functional decline and disability (Deshpande et al., 2008). In a similar vein, lack of positive social activities can represent a risk factor for depression. If identified, such issues can be addressed proactively with clinical interventions or training programs (e.g., balance training: Tennstedt et al., 1998; friendship program: Stevens, 2001). Our activity questionnaire creates a more comprehensive picture of activity participation which could support diagnostic and therapeutic decisions and help to identify preventable risks.

Information provided by the questionnaire could also advance the design of interventions by considering risks and potentials of the patients revealed by their activity profile. As depressive patients can benefit from various activities, including physical and social (e.g., Motl et al., 2005; Schwerdtfeger & Friederich-Mei, 2009), the therapist can identify which activities should be conducted more frequently to enhance the mood and to strengthen the patient's resources. Activity change can also be used to evaluate clinical interventions, providing criteria for treatment progress and success (e.g., Tryon et al., 2006).

Activities assessed by our questionnaire may also be relevant for long-term prediction of cognitive decline in old age. Restrictions in everyday activities are associated with a later diagnosis of dementia (Hertzog et al., 2009; Pérès et al., 2008). The augmented questionnaire could be a more sensitive predictor of future cognitive impairment: Since some of our activity factors strongly relate to cognitive function, activity changes could be a leading indicator of the development of Mild Cognitive Impairment or Alzheimer's disease (Peterson, 2003).

## Limitations and Future Directions

Despite the questionnaire's replicable factor structure and the strong psychometric properties of the scores derived from its scales, this study has limitations that should be addressed in future research. For instance, we would not claim that the reduced item set is optimal for all populations or samples. It is possible that large probability samples would produce better estimates of the prevalence of different activities. It is also possible that specific subgroups

such as individuals with clinical depression or individuals from specific ethnic groups that were underrepresented in our sample (e.g., Asian, Hispanic) show different activity patterns. There was also some variation in reliability across age groups on selected subscales (e.g., travel, TV). Although poorer values may be linked to the small number of items in both scales, differences may also indicate age-differential item interpretations. Thus, replications in larger samples and in subgroups are highly desirable. It would also be important to show convergent and divergent validity of the scores of the activity questionnaire as a measure of leisure activity, by including other assessment methods, such as informant reports, diary entries, or third-party observational data.

Despite these limitations, findings indicate that the scales of the augmented VLS activity questionnaire (a) produce scores with improved content validity regarding physical and social activities; (b) generate scale scores that have acceptable reliability; (c) manifest interpretable patterns of correlations with other constructs; (d) are easily administered; and (e) are of reasonable length to assess activities in young, middle-aged, and older individuals. We argue that the present results promote the validity of using these self-report scales to measure the degree to which older adults are engaged in an active life style that may have benefits for cognition, mental health, and physical health.

Future studies should address in more detail which specific activities are most strongly related to important outcomes, such as mental health and successful aging. Reflecting ideas about life-span development and developmental perspectives on aging well, future studies should address longitudinal changes in activity. Interesting questions entail whether the overall activity level or activity patterns remain stable across the lifespan, or whether stability exists only during specific life phases (e.g., midlife). In that context, it would be essential to evaluate to what extent a general active life style is beneficial relative to specific activities.

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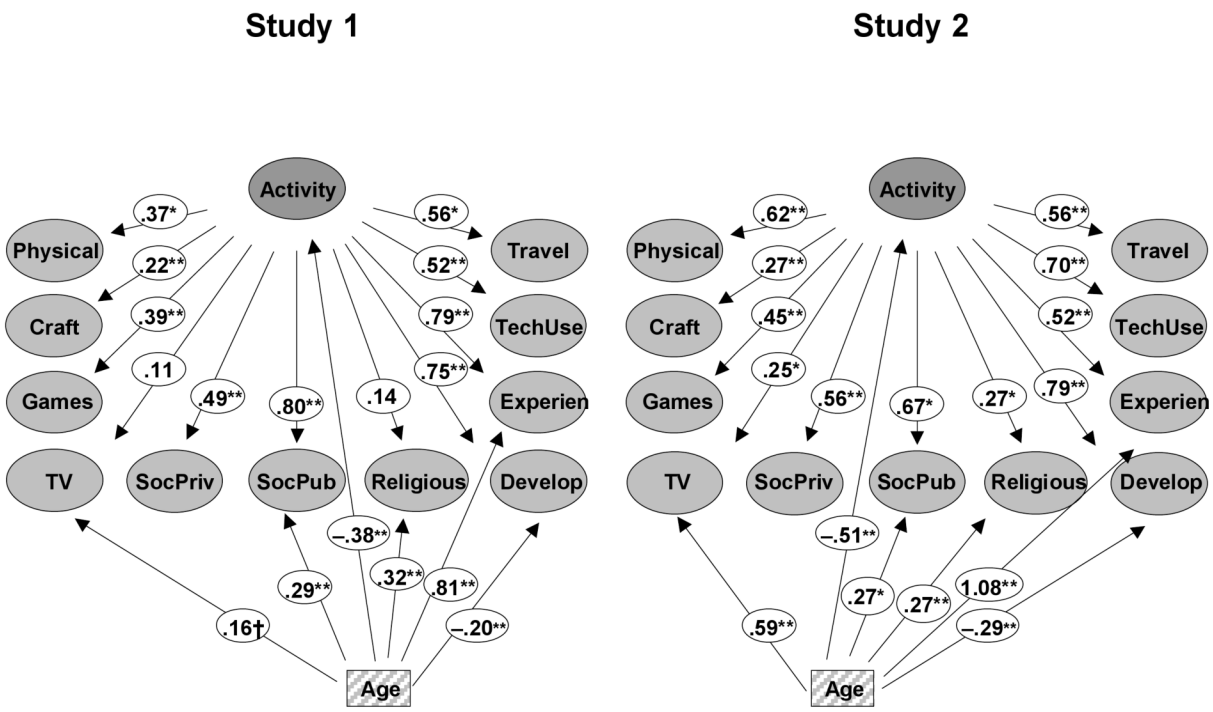


**Figure 1.**
Standardized regression coefficients from a hierarchical factor solution for Study 1 ($N$ = 267) and Study 2 ($N$ = 218).

## Table 1
## Sample Characteristics and Central Constructs of Study 1 and 2

| | Study 1 (*N* = 267) | | Study 2 (*N* = 218) | |
|---|---|---|---|---|
| **Variable** | ***M*** | ***SD*** | ***M*** | ***SD*** |
| Age (years) | 49.58 | 17.32 | 51.66 | 23.43 |
| Gender (females) | 53.9% | | 55.5% | |
| Education (years) | 14.79 | 2.44 | 14.89 | 2.47 |
| Health restrictions (overall)[a] | .00 | .67 | .00 | .67 |
| Subjective health (1 = *very good*, 5 = *very poor*) | 2.22 | .91 | 2.46 | .93 |
| Activity restriction[b] (1 = *very positive effect*, 7 = *very negative effect*) | 4.19 | 1.19 | 4.41 | 1.20 |
| # of medications | 2.03 | 2.02 | 2.12 | 2.24 |
| Depressive affect[c] | 2.87 | 3.05 | 2.70 | 2.76 |
| Activities (overall)[d] | 3.39 | .67 | 3.31 | .69 |
| Physical | 3.61 | 1.82 | 3.68 | 1.79 |
| Crafts | 1.76 | 1.33 | 1.65 | 1.32 |
| Games | 3.21 | 1.48 | 2.63 | 1.51 |
| TV | 5.67 | 1.45 | 5.82 | 1.47 |
| Social-Private | 4.91 | 1.00 | 5.08 | 1.16 |
| Social-Public | 1.90 | 1.49 | 1.94 | 1.31 |
| Religious | 3.82 | 1.85 | 3.56 | 1.96 |
| Technology Use | 3.55 | 1.37 | 3.37 | 1.45 |
| Developmental | 2.57 | 1.41 | 2.45 | 1.31 |
| Experiential | 3.42 | 1.17 | 3.44 | 1.27 |
| Travel | 2.67 | .94 | 2.74 | 1.01 |

[a] *Note.* Health restrictions (overall) represents a unit-weigthed mean composite based on subjective health, activity restriction, and number of medications.

[b] Activity restriction: Mean score based on 6 activity domains (i.e., do chores, get around town, mental recreation, physical recreation, hobbies, travel).

[c] Depressive affect: composite of Well-Being and Depressive Affect subscales of the CES-D.

[d] Activities composite represents the mean of all activities domains.

**Table 2**

**Leisure Activities: Loadings of Confirmatory Factor Analysis (Study 1, N = 267, and Study 2, N = 218)**

| Activities | Phys | Craft | Game | TV | Soc1 | Soc2 | Rel | Trav | Exp | Dev | Tech |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight lift, strength, calisthenics* | .82 / .65 | | | | | | | | | | |
| Aerobics (cardio, fitness, workout)* | .77 / .66 | | | | | | | | | | |
| Flexibility (stretching, yoga, tai chi)* | .54 / .57 | | | | | | | | | | |
| Outdoor (sail, fish, backpack) | .50 / .52 | | | | | | | | | | |
| Exercise (jog, bike, swim) | .30 / .47 | | | | | | | | | | |
| Recreational (tennis, bowling, golf) | .26 / .52 | | | | | | | | | | |
| Repair mechanical device | | .83 / .80 | | | | | | | | | |
| Do household repairs | | .82 / .82 | | | | | | | | | |
| Do woodwork/carpentry | | .66 / .57 | | | | | | | | | |
| Buy item requiring set up | | .53 / .61 | | | | | | | | | |
| Play word games | | | .89 / .71 | | | | | | | | |
| Play knowledge games | | | .81 / .75 | | | | | | | | |
| Play board games | | | .68 / .71 | | | | | | | | |
| Play jigsaw puzzles | | | .49 / .49 | | | | | | | | |
| Do cross-word puzzles | | | .42 / .38 | | | | | | | | |
| Play card game | | | .34 / .47 | | | | | | | | |
| Watch TV comedy/adv. | | | | .62 / .24 | | | | | | | |
| Watch game show on TV | | | | .61 / .32 | | | | | | | |
| Watch TV documentary | | | | .53 / .65 | | | | | | | |
| Watch news on TV | | | | .48 / .32 | | | | | | | |
| Go out with friends* | | | | | .73 / .84 | | | | | | |
| Visit friends or relatives | | | | | .69 / .67 | | | | | | |
| Attend parties (e.g., birthday)* | | | | | .66 / .75 | | | | | | |
| Talk to friend on phone* | | | | | .55 / .45 | | | | | | |
| Give dinner for friends | | | | | .47 / .53 | | | | | | |
| Eat out at restaurant | | | | | .37 / .44 | | | | | | |
| Engaged in political activities * | | | | | | .73 / .57 | | | | | |
| Give public talk | | | | | | .72 / .48 | | | | | |

*Psychol Assess*. Author manuscript; available in PMC 2011 March 1.

| Activities | Phys | Craft | Game | TV | Soc1 | Soc2 | Rel | Trav | Exp | Dev | Tech |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Attend club meetings | | | | | | .64 / .61 | | | | | |
| Attend organized social events* | | | | | | .47 / .33 | .40 / .30 | | | | |
| Volunteer | | | | | | .46 / .40 | | | | | |
| Attend church service/synagogue | | | | | | | .98 / .83 | | | | |
| Engage in prayer or mediation | | | | | | | .44 / .70 | | | | |
| Travel out of town | | | | | | | | .84 / .62 | | | |
| Travel out of state | | | | | | | | .41 / .65 | | | |
| Travel out abroad | | | | | | | | .30 / .37 | | | |
| Business not related to job | | | | | | | | | .50 / .34 | | |
| Collect stamps etc | | | | | | | | | .45 / .17 | | |
| Read for as leisure | | | | | | | | | .45 / .56 | | |
| Read newspaper | | | | | | | | | .41 / .86 | | |
| Garden indoor or outdoor | | | | | | | | | .40 / .43 | | |
| Write letters | | | | | | | | | .39 / .25 | | |
| Sewing, knitting, needlework | | | | | | | | | .18 / .27 | | |
| Read books as part of job | | | | | | | | | | .71 / .56 | |
| Attend public lecture | | | | | | | | | | .64 / .39 | |
| Course at university | | | | | | | | | | .51 / .68 | |
| Creative writing | | | | | | | | | | .47 / .42 | |
| Go to library | | | | | | | | | | .46 / .56 | |
| Study foreign language | | | | | | | | | | .45 / .34 | |
| On-the-job-training | | | | | | | | | | .45 / .37 | |
| Attend movies | | | | | | | | | | .44 / .42 | |
| Use computer software | | | | | | | | | | | .61 / .75 |
| Use electronic calculator | | | | | | | | | | | .51 / .61 |
| Arithmetic calculations | | | | | | | | | | | .51 / .55 |
| Engage in photography | | | | | | | | | | | .39 / .29 |
| Play an instrument | | | | | | | | | | | .24 / .22 |
| Prepare own income tax | | | | | | | | | | | .37 / .17 |

*Note.* Phys: Physical. Soc1: Social Private. Soc2: Social Public. Rel: Religious. Trav: Travel. Exp: Experiential. Dev: developmental. Tech: technology use.

*New items.

**Table 3**

**Latent Correlations Between Specific Activity Factors (Study 1: N = 267, Below Diagonal; Study 2: N = 218, Above Diagonal)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Physical | – | .21* | .24** | −.03 | .38** | .31* | .09 | .62** | −.01 | .51** | .35** |
| 2. Crafts | .23** | – | .15† | .08 | .08 | .09 | −.01 | .21* | .08 | .31** | .10 |
| 3. Games | .22** | .11 | – | .02 | .41** | .11 | .10 | .41** | −.04 | .30** | .16 |
| 4. TV | −.02 | .08 | .30** | – | −.08 | −.02 | .20* | −.29** | .73** | -.09 | .00 |
| 5. Social-Private | .26** | .09 | .28** | .10 | – | .23* | .06 | .55** | −.19* | .29** | .43** |
| 6. Social-Public | .16* | .20* | .19* | .04 | .36** | – | .35** | .54** | .13 | .25* | .40** |
| 7. Religious | −.01 | −.12† | .05 | .12 | −.01 | .25** | – | .03 | .18* | −.03 | .25* |
| 8. Developmental | .40** | .06 | .22** | −.09 | .34** | .59** | −.01 | – | −.31** | .72** | .59** |
| 9. Experiential | .11 | .31** | .16† | .12 | .29** | .56** | .10 | .33** | – | −.06 | .12 |
| 10. Technology | .25** | .16† | .28** | .00 | .31** | .20* | −.19* | .61** | .16 | – | .35** |
| 11. Travel | .15† | .20* | .34** | .02 | .48** | .48** | .05 | .37** | .39** | .23* | – |

†*Note*. $p < .10$.

*$p < .05$.

**$p < .01$

**Table 4**

**Reliabilities of Activity Scales Using Internal Consistency (Cronbach's Alpha) and Retest Reliability (Pearson Correlations)**

| | Study 1 - Reliability | | | | Study 2 - Reliability | | | Study 1 - Retest | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **All (*N* = 267)** | **Young (*n* = 44)** | **Middle (*n* = 131)** | **Older (*n* = 92)** | **All (*N* = 218)** | **Young (*n* = 81)** | **Older (*n* = 137)** | **All (*N* = 133)** | **Young (*n* = 18)** | **Middle (*n* = 62)** | **Older (*n* = 53)** |
| Physical (6) | .78 | .82 | .79 | .74 | .74 | .82 | .68 | .67 | .55 | .70 | .69 |
| Craft (4) | .79 | .83 | .81 | .78 | .79 | .77 | .81 | .79 | .69 | .76 | .85 |
| Games (6) | .77 | .83 | .83 | .67 | .75 | .84 | .69 | .82 | .79 | .77 | .88 |
| TV (4) | .62 | .65 | .71 | .41 | .56 | .72 | .45 | .61 | .69 | .67 | .43 |
| SocPrivate (6) | .75 | .75 | .79 | .63 | .78 | .71 | .77 | .70 | .36 | .75 | .65 |
| SocPublic (5) | .75 | .77 | .81 | .63 | .61 | .70 | .54 | .78 | .64 | .57 | .73 |
| Religious (3) | .67 | .53 | .65 | .74 | .68 | .72 | .64 | .77 | .68 | .70 | .82 |
| Developmental (8) | .74 | .72 | .70 | .63 | .66 | .59 | .55 | .75 | .74 | .66 | .72 |
| Experiential (7) | .57 | .45 | .53 | .54 | .62 | .47 | .38 | .77 | .67 | .75 | .79 |
| Technology (6) | .57 | .69 | .56 | .45 | .58 | .57 | .54 | .78 | .63 | .80 | .76 |
| Travel (3) | .43 | .24 | .59 | .15 | .55 | .61 | .46 | .41 | .28 | .30 | .50 |

*Note.* SocPrivate: Social-Private. SocPublic: Social-Public. Numbers in brackets refer to number of items per scale. For descriptive purpose, the lifespan sample of Study 1 was grouped in young: 18–30 years of age, middle-aged: 31–60 years, and older individuals: 61–81 years)

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**Table 5**

**Correlations of Activity Scales With Cognition, Education, Depression, Health and Age (Study 1, N = 267; Partial Correlations Controlling for Age in Parenthesis)**

| | Memory | Speed | Induct | Fluency | gf | gc | g | Education | Depressive Affect | Health Restrictions | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical | .19** (.11†) | .21** (.11†) | .22** (.13*) | .18** (.13*) | .25** (.15*) | .07 (.11†) | .23** (.15*) | .13* (.16**) | −.12† (−.20**) | −.37** (−.32**) | −.23** |
| Crafts | .05 (.06) | .08 (.10†) | .16** (.19**) | .11† (.11†) | .13* (.15*) | .14* (.14*) | .14* (.16*) | .01 (.02) | −.07 (−.07) | −.10 (−.10†) | .00 |
| Games | .21** (.20**) | .12† (.10†) | .22** (.22**) | .08 (.06) | .19** (.18**) | .10 (.11†) | .19** (.18**) | −.11† (−.13*) | −.11† (−.14*) | −.04 (−.02) | −.07 |
| TV | −.12† (−.11†) | −.07 (−.06) | −.16* (−.16**) | −.20** (−.20**) | −.17** (−.17**) | −.13* (−.15*) | −.18** (−.18**) | −.13* (−.18*) | .06 (.08) | .05 (.04) | .04 |
| Social-Private | .10† (.07) | .24** (.22**) | .19** (.16**) | .10 (.08) | .19** (.17**) | −.05 (−.02) | .15* (.12*) | .04 (.08) | −.23** (−.26**) | −.11† (−.08) | −.10 |
| Social-Public | −.08 (−.07) | .05 (.10†) | −.05 (−.03) | .03 (.04) | −.02 (.02) | −.06 (−.07) | −.03 (−.01) | .09 (.08) | −.18** (−.17**) | −.12† (−.15*) | .06 |
| Religious | −.20** (−.12†) | −.20** (−.09) | −.31** (−.23**) | −.18** (−.13*) | −.27** (−.18**) | −.24** (−.30**) | −.29** (−.23**) | .02 (−.03) | −.14* (−.09) | −.12* (−.22**) | .22** |
| Technology Use | .46** (.40**) | .38** (.30**) | .48** (.43**) | .44** (.40**) | .54** (.50**) | .35** (.42**) | .55** (.50**) | .23** (.31**) | −.04 (−.12) | −.23** (−.16) | −.26** |
| Developmental | .30** (.14*) | .37** (.17**) | .32** (.11†) | .29** (.20**) | .39** (.20**) | .08 (.18**) | .35** (.21**) | .21** (.30**) | .03 (−.11) | −.40** (−.30**) | −.44** |
| Experiential | −.17** (.00) | −.14* (.10) | −.10 (.14*) | .01 (.13*) | −.12* (.12†) | .13* (.07) | −.07 (.11†) | .20** (.18**) | −.23** (−.14*) | .07 (−.08) | .39** |
| Travel | .11† (.07) | .22** (.19**) | .19** (.15*) | .15* (.12*) | .20** (.27**) | .01 (.03) | .17** (.14**) | .16* (.18*) | −.21** (−.25**) | −.10† (−.07) | −.12† |

*Note.* Induct: inductive reasoning. gf: fluid intelligence. gc: crystallized intelligence. g: general intelligence.

† $p < .10$.

* $p < .05$.

** $p < .01$.

**Table 6**

**Correlations of Activity Scales With Cognition, Depression, Health, and Age (Study 2, N = 218; Partial Correlations Controlling for Age in Parenthesis)**

| | Memory | Speed | Induct | Fluency | Working Memory | gf | gc | g | Depressive Affect | Health Restrictions | Age |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical | .25** (.08) | .26** (.07) | .19** (.01) | .03 (.00) | .24** (.09) | .22** (.05) | .03 (.12†) | .20** (.08) | −.05 (−.13†) | −.29** (−.22**) | −.29** |
| Crafts | .06 (−.02) | .04 (−.08) | .16* (.10) | .10 (.08) | .05 (−.02) | .11 (.04) | .22** (.26**) | .16* (.11) | .01 (−.02) | −.13† (−.10) | −.11 |
| Games | .20** (.14*) | .23** (.18**) | .23** (.18*) | .15* (.13†) | .21** (.16*) | .25** (.21**) | .10 (.14*) | .25** (.20**) | −.08 (−.11) | −.13* (−.11) | −.15* |
| TV | −.16** (−.08) | −.16* (−.06) | −.28** (−.24**) | −.19** (−.16*) | −.22** (−.15*) | −.24** (−.19**) | −.14* (−.20**) | −.26** (−.21**) | −.02 (.02) | −.01 (−.06) | .17* |
| Social-Private | .37** (.20**) | .35** (.08) | .31** (.09) | .18* (.12†) | .29** (.09) | .37** (.17*) | −.09 (.02) | .31** (.14*) | −.11 (−.22**) | .03 (.17*) | −.40** |
| Social-Public | .07 (.08) | .05 (.07) | .05 (.06) | .13† (.16*) | .02 (.01) | .09 (.13†) | .06 (.07) | .09 (.12†) | −.18** (−.19**) | −.04 (−.02) | −.01 |
| Religious | −.05 (.03) | −.17 (−.10) | −.19** (−.13†) | −.19** (−.14*) | −.18** (−.13†) | −.19** (−.12†) | −.17* (−.21**) | −.22** (−.16†) | −.07 (−.06) | .10 (.08) | .13* |
| Technology Use | .26** (.09) | .35** (.20**) | .50** (.42**) | .40** (.38**) | .40** (.29**) | .47** (.38**) | .30** (.41**) | .50** (.42**) | −.02 (−.10) | −.21** (−.13†) | −.30** |
| Developmental | .26** (−.03) | .34** (−.07) | .32** (.02) | .22** (.19**) | .26** (−.04) | .35** (.06) | .02 (.20**) | .32** (.11) | .00 (−.14*) | −.30** (−.17*) | −.51** |
| Experiential | −.33** (.07) | −.41** (.11) | −.31 (.13†) | .07** (.21**) | −.31** (.06) | −.30** (.18**) | .29** (.15*) | −.19** (.19**) | −.25** (−.13*) | .18** (.04) | .62** |
| Travel | .04 (.04) | .07 (.03) | .08 (.07) | .09 (.09) | .05 (.02) | .09 (.08) | .05 (.07) | .09 (.09) | −.16* (−.17*) | −.11 (−.10) | −.08 |

*Note.* Induct: inductive reasoning. gf: fluid intelligence. gc: crystallized intelligence. g: general intelligence.

† $p < .10$.

* $p < .05$.

** $p < .01$.

**Table 7**

**Zero-Order Correlations of Activity Scales with Personality (Study 2; n = 215)**

| | Openness | Conscientiousness | Neuroticism | Agreeableness | Extraversion |
|---|---|---|---|---|---|
| Physical | .13† | .14* | .01 | −.25** | .10 |
| Crafts | .03 | .02 | −.04 | −.23** | −.05 |
| Games | .23** | .01 | −.10 | .01 | .13† |
| TV | −.20** | .13* | −.08 | .14* | .09 |
| Social-Private | .12† | .02 | .04 | −.08 | .34* |
| Social-Public | .09 | .02 | −.01 | .17* | .12† |
| Religious | −.16* | .14* | −.07 | .28*** | .07 |
| Technology Use | .31** | .02 | .00 | −.13† | .00 |
| Developmental | .41** | −.07 | .12† | −.21** | .11 |
| Experiential | −.03 | .26** | −.28** | .29** | .01 |
| Travel | .01 | .13† | −.07 | .04 | .14* |

*Note.* Three participants failed to return the NEO PI-R, generating missing data.

† $p < .10$.

* $p < .05$.

** $p < .01$.