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The Effects of Perceived Enjoyable Activities on Cognition in Late-Life

By

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and
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Abstract

Previous research suggests that more involvement in various activities can help delay cognitive decline in older adults. Few studies have examined both the impact of frequency and perceived enjoyment of different types of activities on cognition. This study analyzed the relationship between frequency and pleasure of activities and cognition by running correlations using the five different subscales of the California Older Person's Pleasant Events Schedule (COPPES) and a battery of cognitive tests (Block Design, Animal Naming, Boston Naming Test, Trails A, Trails B, CVLT-LDFR, & Digit Span). It was hypothesized that higher frequency as well as higher level of enjoyment of activities would be positively correlated with cognitive functioning in older adults. The hypotheses were partially supported. Consistent with the hypotheses, there were significant positive correlations between BNT and both Relaxing Frequency and Pleasure, Contemplating Pleasure, Being Effective Pleasure, and both Doing Frequency and Pleasure. Also consistent with the hypotheses, there were significant negative correlations between Trails B and Being Effective Frequency as well as both Doing Frequency and Pleasure. These results imply that higher frequency as well as more enjoyment of certain types of activities may have a positive impact on cognition in later life.

Due to advances in medicine and related sciences, longevity continues to increase, and the number of people ages 65 and older continues to grow. As people age, cognition, and other physical and health factors, begins to decline. There are many different areas of cognition that have been shown to decline in late-life, including executive functioning (Raz & Rodrigue, 2006), verbal fluency (Elgamal, Roy, & Sharratt), processing speed (Salthouse, 2000), attention and working memory (Cavanaugh, 1998), naming (Albert, Heller, & Milberg, 1988), and verbal learning and memory (Lamar, Resnick, & Zonderman, 2003).

In recent years, there has been an increased interest in identifying ways to sustain higher cognitive functioning in older adults. Without any way to decrease the effects of genetic susceptibility to dementias, other possible factors of delayed cognitive decline are being explored. This effect of various types of activity level on cognition has been shown to decrease the possibility of decline in late-life. One study investigated the role of general activity (i.e., reading a newspaper, doing physical activity, participating in hobbies, etc.) on cognitive performance in a community sample of elderly people. They took into account the influence of variables that have been shown to be predictive of cognitive performance such as gender, sensory functioning, health, education, and disability. They studied measures of fluid intelligence, crystallized intelligence, and

memory and found that higher activity levels (above a certain level of participation) positively influenced the level of cognitive performance using ANOVA (Christensen et al., 1996).

In addition to general activity level, there are many different types of activities that have been shown to decrease the risk of cognitive decline and thus the risk of cognitive disorders in late-life. These include social involvement and activity, physical activity, non-physical leisure activity, and cognitively stimulating activities. The purpose of the current study is to explore the relationship between frequency as well as enjoyment of pleasant activities and cognition in later life.

Social, Non-Physical Leisure, and Physical Activity

Social activity, non-physical leisure activity (e.g. reading, playing music, singing in a choir, solving crossword puzzles), and physical activity are a few of the specific activities that research has shown may decrease the possibility of cognitive decline. One review performed a systematic analysis of published observational longitudinal studies that studied the effect of social network (quantity and quality), physical leisure, and non-physical activity on cognition and dementia. These studies used a variety of cognitive assessments including tests of language, memory, visuospatial ability, verbal fluency, decline in cognitive functioning (memory, comprehension, and speed), and intelligence (verbal, nonverbal, and mechanical tasks) in order to test the relationship between social networks/activity, non-physical leisure activities, and physical activity on cognition. They concluded that more social, physical, and non-physical leisure activity protects against the onset of Alzheimer's disease and dementia later in life (Fratiglioni, Paillard- Borg, &

Winblad, 2004). In the sections below, three types of activity will be explored: leisure activity, social activity, and cognitively stimulating activity.

Leisure Activity

Leisure activities and their relationship to cognition are an important research area because they have been shown to help decrease the risk of Alzheimer's and cognitive decline in late-life. One study analyzed the relationship between cognition and different types of leisure activities at baseline and again 20 years later. The activities that were included were political (e.g. delivering a speech at a meeting, participating in demonstrations), organizational (e.g. member of a political party, religious group, other organizations), mental (e.g. reading, hobbies), and physical activity (e.g. gardening, sports). Participants were random samples of the Swedish population who were 56-75 years of age at baseline. They found that there was a significant positive relationship between leisure activities and cognition at least 20 years later, which suggests that engaging in a range of activities may positively affect cognitive functioning in late-life (Käreholt, Lennartsson, Gatz, & Parker, 2010).

Social Involvement

Many studies show that social involvement leads to a decreased risk of cognitive decline. One article provided an overview of epidemiological research that linked different aspects of the social environment such as social network, socioeconomic status, and community-level social characteristics to differences in risks of morbidity and mortality in depressed and non-depressed older adults. They reported that older adults with more social ties and engagement at baseline were less likely to develop dementia or cognitive impairment during the follow-up (Seeman & Crimmins, 2001). Another study

examined whether a decrease in social support would lead to cognitive decline among older adults. Their results showed that a decline in social interaction over a one-year period was related to cognitive decline over the following year (Dickinson, Potter, Hybels, McQuoid, & Steffens, 2010).

Cognitively Stimulating Activities

Another type of activity that has been shown to lead to a decreased risk of cognitive decline is participation in cognitively stimulating activities. One longitudinal study wanted to test the hypothesis that individuals who were engaged in mentally stimulating activities (e.g. reading, listening to the radio, playing games such as cards or checkers, going to museums), may have a decreased risk of developing Alzheimer's disease. In order to test this hypothesis, they used a variety of cognitive tests (e.g. Boston Naming Test, Verbal Fluency, line orientation) and found that the frequency of participation in mentally engaging activities was positively related to cognition (Wilson et al., 2002).

Perceived Enjoyment of Activities and Cognition

In addition to frequency of activities, this study is testing the relationship between level of enjoyment of an activity and cognition. There has not been much research done on the effect of enjoyment of activities on cognition; however, studies have shown that mood and cognition are highly correlated and that lower moods are correlated with lower enjoyment of activities.

For example, there is a link between mood and cognition, and many studies have shown that lower mood is related to cognitive decline. One study using cognitively intact older adults with at least 60 years of age found that clinically meaningful depression and

persistently high depressive symptoms were associated with a higher rate of cognitive decline. Individuals with persistent depressive symptoms were found to have the highest level of cognitive decline especially in areas such as processing speed and global cognition, and tended to perform lower on baseline measures of processing speed, attention, and executive functioning (Köhler et al., 2010).

Furthermore, one study looked at the relationship between mood and number of pleasant activities. The subjects belonged to one of three groups: depressed, psychiatric controls, and normal controls. They used the Pleasant Events Schedule to measure activity level and pleasantness and the Depression Adjective Check List to measure the subject's mood and found that there is a significant positive relationship between pleasant activities and mood (Lewinsohn & Libet, 1972).

To further study the effect of pleasant activities on mood and cognition, another study examined the relationship between pleasant events and depression in older adults. This study focused on the declining ability and desire of older persons with Alzheimer's disease to participate in pleasant activities. To test their hypothesis that depressed Alzheimer's patients will identify fewer events as enjoyable and show a lower frequency of pleasant events than non-depressed patients regardless of their cognitive level, the Pleasant Events Schedule-AD (PES-AD), the Mini Mental State Exam (to test cognitive functioning, MMSE), and the Hamilton Depression Rating Scale (HDRS) were used. They found that Alzheimer Disease outpatients with higher scores on the MMSE scored higher on the PES-AD, and those who scored higher on the HDRS scored lower on the PES-AD. Their results suggest 1) that depression is related to a reduction in enjoyable activities in Alzheimer's patients regardless of cognitive functioning and 2) that subjects

with higher cognitive functioning participated in and enjoyed more activities (Logsdon & Teri, 1997).

There has been a significant amount of research done on the relationship between different activities and cognition as well as the relationship between mood and cognition in later life. Research has also been published on activity level and frequency and enjoyment of pleasant activities in depressed older adults. However, to date there has been very little research published on the relationship between the frequency of perceived pleasant activities (social and non-physical leisure) as well as the individual's perceived level of enjoyment of the activity and cognition in community-dwelling older adults who are able to live on their own. The current study attempts to remedy the lack of research in this area by examining the relationship between various activities, perceived level of enjoyment, and cognitive functioning. Based on the above literature review, it is hypothesized that there is a positive relationship between frequency of perceived pleasant activities and better cognitive functioning in later life. It is also hypothesized that there is a positive relationship between perceived level of enjoyment of an activity and cognition.

Methods

Participants

This study was comprised of community-dwelling adults (N= 55) of at least 65 years of age. The study was initially designed to look at differences between musicians and non-musicians; however, for the purposes of the current study, the participants will not be separated into groups. Each participant was required to be able to independently complete a full written consent form. Participants with the presence of a mood (e.g. major depression or anxiety) or neurological (e.g. Alzheimer's disease, Dementia, stroke)

disorder, who show significant cognitive impairment or psychoses, or cannot live independently, were excluded from the data. Participants were recruited through advertisements (e.g. flyers) in local media outlets and with the help of the community music program at the University of Louisville School of Music. Trained graduate and undergraduate psychology students administered the assessments on the University of Louisville's Belknap campus or in the home of the participant. Compensation for participating in the study was that the participants were placed in a drawing for one of six \$50 gift cards.

Measures

The cognitive test battery was designed to assess different cognitive domains that have been shown to decline with age (Raz & Rodrigue, 2006). All measures chosen showed strong psychometric properties.

- **Trail Making Test:** This is a task that measures executive functioning and processing speed. The participant must connect numbers (e.g., 1-2-3) or numbers and letters (e.g., 1-A-2-B) as quickly as they can in order (Arbuthnott & Frank, 2000; Sánchez-Cubillo et al., 2009).
- **Animal Naming:** This test requires the participant to name as many animals as they can in 60 seconds and measures verbal fluency, which is the ability to produce unique words that belong to a category or begin with a certain letter (Ruff, Light, Parker, & Levin, 1996).
- **Digit Span:** This test is part of the Wechsler Adult Intelligence Scale (WAIS-IV; Wechsler, Coalson, & Raiford, 2008) and measures processing

speed, attention, and working memory by requiring participants to repeat a progressively longer list of numbers.

- Boston Naming Test (BNT): This test presents a series of pictures of items (e.g., bed, pencil, or pretzel) that the participant must name. This task also includes levels of cueing if the participant is having difficulty naming the item (Ferraro & Lowell, 2010).
- California Verbal Learning Test (CVLT): This test measures verbal learning, as well as immediate, delayed, and recognition of verbal memory. During this test, a list of words is read several times for immediate recall and learning. After 20-30 minutes, participants must recall as many of the words as they can. Directly after delayed recall, forced recognition is used to assess recognition memory (Elwood, 1995; Woods, Delis, Scott, Kramer, & Holdnack, 2006).
- WAIS-III Block Design: Visuospatial skill and processing speed is assessed with this task. The participant is required to match the picture that is shown to this with the blocks in front of them (Wechsler et al., 2008).
- California Older Persons Pleasant Events Scale (COPPES): COPPES is a self-report measure consisting of 66 items that are perceived to be enjoyable and are split into five subscales: Socializing (8 items), Relaxing (12 items), Contemplating (9 items), Being Effective (9 items), and Doing (8 items). For a list of sample questions, please see Table 4. These subscales were used during the analysis. COPPES consists of 2 ratings (0-

2), one of which the participant rates how often they have done the activity (e.g., listening to music, reading literature, visiting a museum) in the past month, and the second of which the participant rates how much they enjoyed the activity or how much they would have enjoyed the activity if they had done it. During analysis, calculations were done for the frequency score within each subscale and the same was done for pleasure (Gallagher-Thompson, Thompson, & Rider, 2004).

- On all cognitive tests except for Trails, a higher score is better. On Trails, a lower score is better.

Procedure

Initially, participants were screened through a phone interview. The interview explains the general outline of the study so that the participant understood what he/she could expect from the experience and what would be expected of him/her. After a more detailed explanation, if the participant wanted to participate, he/she was asked to answer a few questions to ensure that they fit the inclusion requirements. Questions included were: age, living situation, current diagnosis of depression or any cognitive impairment.

The individual was then scheduled for testing. Before testing began, he/she was asked to fill out a consent form with the examiner in which a summary of the study, risks, and objectives were discussed. The participant was also informed that they may decline to answer a question or complete a task that makes him/her feel uncomfortable as well as discontinue at any time. Participants were then asked to complete a questionnaire about their musical experience including questions about how often they listen to music and what type of music they listen to. Musicians received another questionnaire inquiring

about when they began playing, what instrument(s) they play/played, if involved in ensembles, if took private lessons and how long, etc. The participants then were administered the neuropsychological testing battery. After the testing was complete, they answered other questionnaires that measure mood, physical activity, quality of life, and level of social involvement. Each participant was given a number that was used on all documents for de-identification.

Design and Statistical Analysis

This study used a correlational design to examine the relationship between frequency and perceived enjoyment of involvement in various activities and cognition. Pearson Correlations were made between frequency as well as perceived enjoyment within each of the five subscales of COPPES (Socializing, Relaxing, Contemplating, Being Effective, & Doing) and an assortment of cognitive tests (Block Design, Animal Naming, Boston Naming, Trails A, Trails B, California Verbal Learning- Long Delay Free Recall, and Digit Span) using SPSS. Pearson Correlations were calculated because all of the variables were continuous and correlations with $p < .05$ were considered significant.

Results

Demographics and mean performance on cognitive testing measures are shown in Table 1 and Table 2. Most participants were Caucasian, highly educated, and the ratio of males to females was balanced. Pearson correlations were analyzed comparing various measures of cognitive functioning (Block Design, Animal Naming, BNT, Trails A & B, CVLT-LDFR, & Digit Span) and frequency and perceived pleasure of activities within each of the subscales of COPPES. For full correlation values, please see Table 3 and for sample questions of each of the COPPES subscales, see Table 4. It was hypothesized

that there would be a positive relationship between higher frequency of perceived pleasant activity and cognitive functioning in older adults as well as higher levels of enjoyment of activities and cognition. These hypotheses were partially supported. As predicted, higher frequency and perceived pleasure of activities showed a positive relationship with cognition, however, only in some subscales of the COPPES and with certain cognitive tests.

The frequency of socializing was significantly correlated with all other frequency of activity levels (see Table 3). However, social frequency was not correlated with any cognitive testing measures. The results reveal that more frequent Socializing activity, was correlated with all other types of COPPES subscale activities, however, there was no correlation to cognition found.

For the Relaxing subscale, a significant positive correlation was found between both Relaxing Frequency and Relaxing Pleasure and the BNT ($r=.310$, $p<.05$; $r=.455$, $p<.01$; respectively). This indicates that for the Relaxing subscale, the more frequently a participant did these activities and the more they enjoyed the activities, the better they performed on the BNT. There were no other correlations between Relaxing subscales and any other cognitive measures analyzed. However, the relationship between Relaxing Frequency and CVLT-LDFR approached significance ($r=.266$, $p=.065$).

Higher amounts of perceived pleasure on Contemplating Activities was correlated with higher scores on the BNT ($r=.288$, $p<.05$), indicating that more pleasurable rated activities in the Contemplating subscale were correlated with higher scores on the BNT. There were no other cognitive tests that showed a significant correlation with Contemplating Activities in neither Frequency nor Pleasure. However, the relationship

between Block Design and Contemplating Pleasure neared significance ($r=-.261$, $p=.074$), which was surprising because it was hypothesized that as the perceived pleasure increased, Block Design score would increase.

Trails B and Being Effective Frequency were negatively correlated ($r=-.380$, $p<.01$) and both Being Effective Frequency and Pleasure showed a positive correlation with BNT only, ($r=.341$, $p<.05$). However, a positive correlation between BNT and Being Effective Frequency approached significance ($r=.260$, $p<.065$). These results show that faster completion of Trails B was correlated with higher frequency of Being Effective items and that better scores on BNT were correlated with higher frequency as well as pleasure of the Being Effective subscale.

For the Doing subscale, there were many significant relationships found. Both Doing Frequency and Pleasure revealed positive correlations with BNT ($r=.294$, $p<.05$; $r=.393$, $p<.01$) as well as a negative correlations with Trails B ($r=-.418$, $p<.01$; $r=-.355$, $p<.05$). However, Doing Frequency showed an additional relationship with Block Design ($r=-.305$, $p<.05$). All of these results indicate that higher frequency and pleasure on the Doing subscale is correlated with better results on the BNT and Trails B. Also, the results reveal that, contrary to the hypothesis, higher frequency of Doing Activities was correlated with lower scores on Block Design.

Discussion

This study was conducted in order to examine the relationship between frequency of perceived pleasant activities and cognition in late life as well as the relationship between level of enjoyment of pleasant activities and cognition. It was hypothesized that there would be a positive correlation between frequency of perceived pleasant activities

in all subscales of COPPES and cognition. It was also hypothesized that there would be a positive correlation between level of perceived enjoyment of the activities and cognition.

Previous research has found that many types of activities, including social activity, leisure time, and physical activity, have positive impacts on cognition in older adults (Christensen et al., 1996). Social activity in particular has been found not only to have a unique positive impact on cognition in older adults but also decreases the risk of cognitive decline (Fratiglioni, Paillard- Borg, & Winblad, 2004). Research implicates social networks and being socially engaged as predictors both of current and future cognitive functioning (Dickinson, Potter, Hybels, McQuoid, & Steffens, 2010; Seeman & Crimmins, 2001). In addition to these activities, cognitively stimulating activities have been shown to have a positive impact on cognition (Wilson et al., 2002).

Previous research has also found that there is a link between mood and cognition as well as mood and enjoyment of activities. Lower moods have been shown to be related to a decline in cognitive functioning (Köhler et al., 2010) and also a decline in the number of activities one finds enjoyable (Logsdon & Teri, 1997).

Results from the current study partially support the predictions of a positive relationship between frequency of activities and cognition as well as between level of perceived enjoyment of activities and cognition. Certain subscales of a measure of social and leisure activities (COPPES) were found to be significantly related to scores on some cognitive tests. Higher scores on a confrontation naming task (BNT) were related to having higher scores on a few subscales, including Relaxing Frequency and Pleasure rating, Contemplating Pleasure rating, Being Effective Pleasure rating, and Doing Frequency and Pleasure ratings. The results suggest that individuals who both did these

activities more often *and* who enjoyed these activities more, benefit on some of their language abilities, like being able to find words they want to use.

Faster completion of Trails B was significantly related to higher scores on the Being Effective Frequency and Doing Frequency and Pleasure subscales. Trails B measures aspects of executive functioning, including the ability to switch between categories; on this test, those categories are numbers and letters. These results suggest that participating in activities included in the Being Effective subscale as well as the Doing subscale and enjoying activities in the Doing subscale benefit on some aspects of executive functioning.

This study was correlational, so no causation can be found. It cannot be determined with these results whether activity is affected cognition or people with higher cognition do and enjoy activities more. However, the results of the current study have some implications for delaying declines in cognition in late-life. For example, confrontation naming, as measured by the BNT, is often one cognitive ability that declines in the early stages of Alzheimer's disease (Lin C.Y. et al., 2014). Our results showed that confrontation naming was higher in individuals who were more active in certain subscales, and, therefore, it is possible that people who engaged in these activities decreased their risk of cognitive decline in specific cognitive areas that are related to Alzheimer's. Also, executive functioning has been found decline with the onset of dementia (Razani, et al., 2007). Our results suggest that engaging in as well as enjoying various activities may help delay executive functioning decline.

Although this study did find important relationships between some activities and cognition, there are a few limitations to the current study. The sample size of this study

was small and homogenous; the majority of participants were Caucasian and highly educated (see Table 1 for full demographics), making the results of the study difficult to generalize to a more diverse group of people. The sample size was large enough to detect some significance but more may have been found with a larger sample. Another limitation is that this study was not longitudinal. A longitudinal design would allow for recording changes in the participants over time and may lead to being able to suggest a causal relationship in addition to correlations. This study was analyzed using correlations thus no causation can be determined. Also, COPPES is a self-report survey. Answers are based on a participant's memory and opinions on how frequently they did an activity and how much they enjoyed or would have enjoyed the activity. There are inherent errors to self-report data as opposed to tracking data in vivo.

The study does have credible findings for a few reasons. Although there are limitations to the study, various cognitive tests were used in order to examine a wide range of cognitive domains. There are also a broad range of activities listed in COPPES that many people are able to participate in and have found to be pleasant. Additionally, the study has an even distribution of males and females, so results can be generalized to both genders.

Future research should focus on further explaining the relationship between social activity and cognition in late-life. A longitudinal study with a larger sample size would help establish causation between activities and cognition. We currently lack a good understanding of this relationship and a longitudinal study could help determine if people stop doing activities as their cognition declines, or if cognition declines because they become less engaged in activities. Additionally, a more even ethnicity distribution would

help the results from the study be generalized to a larger population. Are results consistent in African American populations or Hispanic populations? A more diverse sample could help us better understand if and how much ethnicity is a factor in the relationship between activity and cognition.

Overall, the current study found that some activities are very much related to cognitive functioning, particularly, confrontation naming and executive functioning. This study has important implications for cognitive functioning in older adults, and further research on this topic could help delay the onset of cognitive decline and, furthermore, the onset of dementias including Alzheimer's disease.

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Table 1
Participant Demographics

Demographic	Range	Percent	Mean (SD)
Age	65-88		73.11 (5.95)
Race	African American (N=1)	1.8	
	Caucasian (N=53)	96.4	
	Native American (N=1)	1.8	
Gender	Male (N=30)	54.5	
	Female (N=25)	45.5	
Education Level	Less than 12 th grade (N=2)	3.6	
	High School (or GED) (N=3)	5.5	
	Some College or specialized training (N=7)	12.7	
	College Graduate(N=15)	27.3	
	Graduate Training(N=28)	50.9	

Table 2
Average Participant Performance on Measures of Cognition

Measure (Standard Scores)	Mean (SD)
Block Design ¹	12.25 (2.76)
CVLT- LDFR	.65 (.92)
Trails A	11.2 (2.47)
Trails B	10.98 (3.21)
Digit Span	11.6 (2.15)
Animal Naming*	60.44 (12.40)
BNT*	56.71 (11.34)

Note: CVLT-LDFR= California Verbal Learning Test- Long Delay Free Recall; BNT= Boston Naming Test

¹Missing data on 2 participants

* t score instead of Standard Score

Table 3

Pearson Correlations between COPPES Subscales and Cognitive Measures

	BD	Animal Naming	BNT	Trails A	Trails B	CVLT- LDFR	DS
Socializing Frequency (N=52)	.018	.056	.014	-.069	-.154	.063	.161
Socializing Pleasure (N=50)	-.070	-.089	.201	-.053	-.056	.006	.118
Relaxing Frequency (N=49)	.202	.246	.310*	-.160	-.242	.266	-.017
Relaxing Pleasure (N=46)	.077	.011	.455**	-.177	-.082	.084	.163
Contemplating Frequency (N=52)	-.103	-.081	.214	-.077	-.161	.033	.041
Contemplating Pleasure (N=50)	-.261	-.079	.288*	-.182	-.158	.017	.070
Being Effective Frequency (N=51)	.006	-.038	.260	-.093	-.380**	.123	-.042
Being Effective Pleasure (N=51)	.109	-.014	.341*	-.071	-.147	.199	.070
Doing Frequency (N=52)	-.305*	-.043	.294*	-.137	-.418**	.139	-.031
Doing Pleasure (N=47)	-.217	-.065	.393**	-.184	-.355*	.030	-.014

*p<.05 **p<.01

Table 4
COPPEs Subscales Sample Questions

Socializing	Relaxing	Contemplating	Being Effective	Doing
Kissing, touching showing affection	Seeing beautiful scenery	Thinking about myself	Doing a project my own way	Doing volunteer work
Being with someone I love	Listening to music	Meditating	Having an original idea	Working on a community project
Making a new friend	Reading literature	Going to church	Having a daily plan	Creative Crafts
Smiling at someone	Visiting a museum	Feeling a divine presence	Being needed	Shopping for a new outfit

* Each item had a score from 0-2 for both frequency and pleasure

