Creativity in the Later Life: Factors Associated with the Creativity of the Chinese Elderly

ABSTRACT

This study examined a total of 140 elderly Chinese from China and the United States to investigate the relationship between attitude toward aging, daily activities, general health, education, and other demographics and rated creativity as measured by collage making and storytelling. The result of this study shows that creativity declines with age. However, education, general health status, daily activities, and the attitude toward aging are also found to be decisive factors of creativity. The implications of the findings are discussed.

Keywords: creativity, aging, individual differences.

The aging population reflects improving health and economics, but it also brings challenges to a society. According to the 2012 world population data, there are over 121 million people, or about 9% of the total population, aged equal or above 65 in China (Population Reference Bureau, 2012). China is officially marching into an aging society (Chyi & Mao, 2012). With a longer life expectancy (71 for male subjects and 74 for female subjects) and China’s early retirement policy (60 years for men, 55 for female civil servants; and 50 for female workers), older Chinese people have a longer post-retirement life, with an average 11 years for men and 19–24 years for women (Population Reference Bureau, 2012). It is therefore very important to improve the well-being of this growing population. Numerous evidences have suggested that creativity is an important part of successful aging (e.g., Fisher & Specht, 1999; Flood, 2007; Flood & Phillips, 2007; Gladding & Martin, 2010; Malchiodi, 2012). Given the increasing number and special characteristics of the aging population in China, what are some of the age-related characteristics of creativity among Chinese elderly? Most importantly, what are some factors associated of creativity and what can a society do to help enhance creativity in later lives to improve the well-being of the aging population?

It is well documented that most cognitive functions show significant declines during the aging process, such as working memory, reaction time, problem solving, and decision-making. For example, researchers found that working memory started to decline in the 20s, then had regular downward trends in each decade across the lifespan (Park et al., 2002, 1996). Age-related decline in reaction time was also
demonstrated to appear already in middle age (Meijer, de Groot, van Gerven, van Boxtel & Jolles, 2009). In a meta-analysis of 28 studies with 4,482 subjects, Thornton and Dumke (2005) discovered age differences of moderate magnitude in everyday problem solving and decision-making effectiveness. On the other hand, some cognitive functions remain intact during aging, including verbal knowledge (Park et al., 2002), discourse skills (Kemper & Kemtes, 1999), semantic memory (Piolino, Desgranges, Benali & Eustache, 2002), and emotional processing (Carstensen, Fung & Charles, 2003). In a review of existing neuroanatomical research on age-related brain changes and age-related cognition changes, Salthouse (2011) found that brain structure variables could not sufficiently explain the decline or reservation of cognitive functioning in older people.

Cattell (1971) and Horn’s (1970, 1982) intelligence theory provides a summary of the lifespan development for two distinct types of intelligence, fluid intelligence and crystallized intelligence. Fluid intelligence refers to the abilities that show adaptation to new environments, such as problem solving. Compared with fluid intelligence, crystallized intelligence refers to abilities that result from earlier learning experiences. Previous research on age change in fluid intelligence and crystallized intelligence has reported consistent findings that crystallized intelligence was maintained across the life span, whereas fluid intelligence reached an early maximum and declined steadily (e.g., Kaufman & Horn, 1996; Kaufman, Reynolds & McLean, 1989; Wang & Kaufman, 1993). For example, using the Kaufman Adolescent and Adult Intelligence Test (KAIT) developed by Kaufman and Kaufman (1993), in a sample of 1,500 men and women aged between 17 and 94 years, Kaufman and Horn (1996) demonstrated that the composite score of fluid intelligence declined steadily during the entire adulthood, and rapidly from about age 50; whereas crystallized intelligence increased through the 20s, remained steady until age 60, and declined thereafter. According to psychometric research, there were reported associations of moderate magnitude between creativity and intelligence (Cramond, Kim & VanTassel-Baska, 2010; Kim, 2005; Sternberg & O’Harra, 1999), especially with regards to fluid intelligence (Sligh, Conners & Roskos-Ewoldsen, 2005). However, as creativity and fluid intelligence do not overlap in all aspects (e.g., Cramond et al., 2010; Kaufman, Kaufman & Lichtenberger, 2011; Kim, 2005, 2008; Sligh et al., 2005); the developmental trajectory of fluid intelligence has failed to offer an explanation about the true developmental process of creativity.

Studies on creativity in an aging population started in the 1970s, and most of these studies used divergent thinking to represent creativity, adopting divergent thinking measurements, such as the Torrance Test of Creative Thinking (TTCT) (Torrance, 1966) (e.g., Alpaugh & Birren, 1977; Alpaugh, Parham, Cole & Birren, 1982; McCrae, Arenberg & Costa, 1987; Syloco, 1983). For example, Alpaugh and Birren (1977) analyzed divergent thinking, intelligence, and preference of complexity in a sample of 111 adults between the ages of 20 and 83. They found that both composite divergent thinking scores and scores on the Barron–Welsh Art Scales declined with age (Barron & Welsh, 1952), but no age differences were found on the information and similarities subtests of Wechsler Adult Intelligence Scale (WAIS;
Wechsler, 1958). McCrae et al. (1987) conducted a longitudinal study to assess creativity using six tests of divergent thinking: associational fluency, expressional fluency, ideational fluency, word fluency, obvious consequences and remote consequences. The last test, consequence, is an unusual test, which asks subjects to imagine consequences for unusual situations. With a sample of 278 men ranging from 17 to 101 years over the period from 1959 to 1972, they found a decline for all six aspects of divergent thinking after a 6-year interval, most of which could be attributed to reduced response production. Furthermore, using divergent thinking measurements, earlier studies also showed that the elderly had higher scores on elaboration, followed by originality, fluency, and flexibility (Sylcox, 1983); reduced information processing speed and unwillingness to question the conventional solutions accounted for an age-related decline in creativity (Ruth & Birren, 1985); and instead of generating a large number of creative products, integrative thinking and originality were the most prominent characteristics of aging creativity (Sasser-Coen, 1993).

In contrast to the divergent thinking research studies, for example, Roskos-Ewoldsen, Black and McCown (2008) analyzed the cognitive aspect of creativity based on Finke, Ward and Smith’s (1992) Geneplore model of creativity. According to the Geneplore model, creativity has two phases, generating an idea and exploring the implications of the idea. Comparing the sample of 41 young adults and 41 older adults, Roskos-Ewoldsen et al. (2008) used the Creative Invention Task (CIT) and TTCT to measure creativity. They found that the age-related decline of creativity was prominent in two phases of CIT, but not on TTCT.

Another line of research focused on how creativity may help to improve the health and well-being of older people (for a review, see Flood & Phillips, 2007; Fisher & Specht, 1999; Flood & Scharer, 2006; Gladding & Martin, 2010; Malchiodi, 2012). For instance, Fisher and Specht (1999) conducted a qualitative study on 36 elderly who were contributors to a senior art exhibition. They found that artistic creativity could facilitate “successful aging” through encouraging the development of problem-solving skills, motivation, and perceptions, in terms of the following six factors: a sense of purpose, interactions with others, personal growth, self-acceptance, autonomy, and health. Flood and Phillips (2007) also found that by engaging in creative activities, such as journaling, reminiscing, poetry-writing, and creating art projects can improve problem-solving abilities, self-esteem, coping skills, anxiety, internal locus of control, life satisfaction, as well as depressive symptoms and hypochondriasis. They also found one’s attitude toward life might help the process of successful aging. In addition, promising therapeutic effects of artistic creativity programs had been consistently discussed in the literature (for a review, see Flood & Phillips, 2007; Cohen et al., 2006; Flood & Scharer, 2006; Gladding & Martin, 2010; Malchiodi, 2012). For example, a longitudinal study that examined painting, writing, poetry, jewelry making, and material cultural intervention programs, was conducted on a community sample of 166 healthy adults from Washington, DC. Results from the comparison of the intervention group and the control group revealed that creative art therapy was associated with physical health, morale, less loneliness, and the activity level of the elderly (Cohen et al., 2006).
Using archival data analysis, especially analyzing the biographies of eminent historical figures, some researchers have explored the relationship between age and creativity of “great people”, often called the Big C. Lehman (1953), for example, analyzed the quality of lifespan production of the master pieces in arts (e.g., paintings, poems), and found that the quality of the creative contribution was highest between the ages of 30 and 40, then gradually declined. Focused on the quantity of creative productivity, without evaluating the quality of such productions, Dennis (1966) also found a decline in the number of creative products with advancing age. Using historiometric approach, Simonton (1977, 1984, 1985, 1990, 1996, 1997) examined the life-span development of creativity among eminent individuals across different historical periods. According to Simonton, creative productivity followed an inverted U-shaped trajectory across the creators’ career life, although the proportion of the high quality pieces remained unchanged.

Closely related to the current study, Jaquish and Ripple (1984) conducted a cross-cultural study comparing American and Chinese divergent thinking across five age groups (from children to middle age adults) by measuring the fluency, flexibility, and originality of the participants’ imaginative response to a series of taped sounds. Based on this data, they found that fluency and flexibility were highest during adolescence in the Chinese sample, but during middle-age in the US sample. However, even though these findings were similar to those found in studies from western cultures, there’s a paucity of research on cognitive functioning in the aging population in China, especially on creativity.

Research on the well-being of the Chinese elderly has shown that their perceptions of successful aging were common to those observed in western cultures (Ku, Fox & McKenna, 2008); with gender, education, marital status, social support, living arrangement (e.g., living with grandchildren), participation of activities, and attitude as important indicators of later life satisfaction (Chou & Chi, 2002; Chyi & Mao, 2012; Leung et al., 2011; Li & Liang, 2007). In general, previous studies have demonstrated that neurological declines in the cognitive functions of the elderly could be affected by different cultural factors (for a review, see Park & Gutchess, 2002).

**DAILY ACTIVITIES IN AGING**

One important behavioral factor influencing creativity of the elderly could be participation in daily activities. Earlier literature on daily activities has shown that leading an active lifestyle was positively related to the preservation of cognitive functions in later life (e.g., Arbuckle, Gold & Andres, 1986; Christensen et al., 1996; Havighurst, Neugarten & Tobin, 1968; Hill, Wahlin, Winblad & Bäckman, 1995; Hultsch, Hertzog, Small & Dixon, 1999). Theoretically, engagement in activities is associated with “successful aging” (Flood & Phillips, 2007; Menec, 2003). To assess daily activities, many studies focused on a specific type of activities, such as physical activities (e.g., aerobic exercise), social activities (e.g., visiting friends), and intellectually engaging activities (e.g., going to the library) (Clarkson-Smith & Hartley, 1990; Smits, van Rijssel, Jonker & Deeg, 1995; Wilson et al., 2005), whereas other studies focused on a broader range of activities (e.g., Hultsch, Hammer & Small,
1993; Hultsch et al., 1999; Jopp & Hertzog, 2007). For example, Hultsch et al. (1999) conducted a longitudinal study examining the relationship between participation in activities and cognitive functioning in a sample of 250 middle-aged and older adults. Using a list of 70 activities in six categories (physical activity, self-maintenance, social activity, hobbies, passive information processing, and novel information processing), they found that intellectually engaging activities predicted better cognitive function of memory, vocabulary, verbal fluency, reading comprehension, working memory, comprehension speed, and semantic speed. In addition, to explore the actual mechanisms underlying activity and aging cognition, recent correlational studies analyzing the direct biological and cognitive effects of aging activities have reported that aerobic exercise could increase the cerebral blood flow in older adults (Hall, Smith & Keele, 2001); social activities were positively associated with perceptual speed (Lövdén, Ghisletta & Lindenberger, 2005); and involvement in cognitive activity was associated with a reduced incidence of Alzheimer’s disease and mild cognitive impairment (Wilson, Scherr, Schneider, Li & Bennett, 2007). On the other hand, Leung et al. (2011) investigated the relationship between participation in leisure activities and cognitive decline in a sample of 505 healthy elderly Chinese from Hong Kong. Based on the activity data of four different categories (physical, intellectual, social, and recreational), they showed that participating in intellectual activity (e.g., reading books, playing a musical instrument, or gambling) was associated with less cognitive impairment in older adults. Wang et al. (2006) collected longitudinal data of 5,439 people aged over 65 from Chongqing, China, and found that playing board games and reading were associated with better cognitive functioning as measured by Mini-Mental State Examination, whereas watching TV would increase the risk of reduced cognition. However, despite including both activity and cognition functions in the previous studies of the elderly, the effect of activity on creativity in the Chinese aging population has yet to be empirically documented.

**ATTITUDE TOWARD AGING IN ELDERLY**

Another psychological variable that may affect creativity in later life is attitude toward aging. In general, the elderly are mostly depicted as a group of helpless and rigid people and the language used in our society to describe the aging population is overwhelmingly negative (Braithwaite, 1986; Nuessel, 1982; Scholl & Sabat, 2008). According to Levy’s stereotype theory of aging (Levy, Zonderman, Slade, & Ferrucci, 2009), aging stereotype develops as early as childhood, is reinforced during adulthood, and becomes self-stereotype in older age. Early studies on the effect of aging stereotypes focused on younger individuals; but the trend of recent research has shifted to the actual targets of these stereotypes, older individuals. Researchers have consistently reported the effects of negative perception of aging on reduced cognitive and physical functions in the elderly, such as memory, mathematical self-efficacy, visual perception, and gait speed (e.g., Levy, 1996; Levy, Hausdorff, Hencke & Wei, 2000; Levy & Leifheit-Limson, 2009; Levy, Slade, & Gill, 2006; Levy, Slade, & Kasl, 2002; Levy, Slade, Kunkel, & Kasl, 2002). For example, Levy, Slade, and Kasl (2002; Levy, Slade, Kunkel, et al. 2002) used data from the Ohio Longitudinal Study of
Aging and Retirement (433 participants over 50 years), and found that positive self-perception of aging could predict greater functional health over time and participants with a positive attitude toward aging lived an average 7.5 years longer than those with a negative attitude. Furthermore, Levy (1996) successfully improved subjects’ memory in the laboratory by shifting the negative stereotypes of aging to more positive stereotypes in a sample of ninety 60-year-old individuals, which identified a causal relationship between attitude to aging and cognitive function. Lai (2009) investigated attitude toward aging and the relation to mental health in a mixed sample of 4,240 Chinese elderly (over 55 years old) from Mainland China, Hong Kong, Taiwan, Canada, and the United States. Five researcher-constructed statements were used to measure attitude toward aging: (a) having a senior at home is a treasure to the family, (b) an elderly is a burden to the family and society, (c) life is all downhill in old age, (d) aging is just another stage in life that everyone has to go through, and (e) being old is something to be proud of. The 36-item Short Form Health Survey (SF-36) was used to measure the mental health component of participants. This study showed that attitude toward aging was the most powerful predictor of mental health in older people. Nevertheless, despite the previous literature, the role of attitude toward aging as a psychological determinant of the creative ability of older people has seldom been examined in the Chinese population.

The current study aimed to further investigate the relationship between age and creativity of Chinese ordinary elderly. We took the product-orientated approach, using the Consensus Assessment Technique (CAT; Amabile, 1982, 1996) measuring creativity in both the art and literature domains. Based on the past literature, it was hypothesized that aging would have a negative association with creativity in the two domains. The second objective of this study was to explore individual variables influencing creativity performance. In particular, some important variables, behavioral factors such as daily activities, and the psychological factor such as attitude toward aging were explored. Based on the previous studies, both factors would be positively associated with creativity in the two domains.

METHODS
PARTICIPANTS

Participants were 140 Chinese elderly (103 female), aged between 50 and 92 years old ($M = 77.80$, $SD = 9.95$); 119 were 65 years old or older. Most participants did not have a college education (86.4%). The average years of retirement for the entire sample was 22.146 ($SD = 10.244$). The reason for inclusion of people aged between 50 and 65 is because 50 is the official retirement age for female workers in China. The age of 50 and older is considered to be elderly according to many standards in China.

Among the participants, 91 were from Guangzhou, China, 15 were from New York City, and 34 were from the New Haven area in Connecticut.

The Gongzhou sample was selected from a senior center. All participants were healthy elderly residents living in the Guangzhou Yi Shou Senior Center. Participants with dementia or other significant cognitive impairments, based on the
medical record provided by healthcare staff and the individual, were excluded from the current study. The first author, a female graduate student in psychology, obtained the official authorization for conducting a study from the senior center. The New York sample was selected from an English Learning Institute in Chinatown, New York. All participants were recent immigrants from Guangdong, China, and spoke a limited amount of English. The New Haven sample was selected through a local Chinese church. Participants were predominately relatives of Chinese scholars affiliated with a major university community who came to the United States under B1 visas. They were originally from different regions of China. Both the New York and New Haven sample participants were recruited individually and they appeared to be healthy and could engage freely with the experimenter. In addition, as both US samples were composed of individuals who spent the majority of their lives in China, they met the sampling criteria of the target participants in the current study.

PROCEDURE

Participants were tested individually in the form of one-on-one interviews, and the whole process lasted approximately 1 hour. Before proceeding with the study, participants were given information about the purpose of the study, and the interviewer spent a few minutes with them first to familiarize the participants with the environment. During the interview, participants received the Informed Consent, completed two creativity tasks and answered a series of structured questionnaires. The first author and a trained undergraduate student from China who had experience in conducting the interview collected the Guangzhou data. Both authors collected the New York and New Haven data. The Guangzhou and New York subjects spoke Cantonese, and the New Haven subjects spoke Mandarin. Interviewers used participants’ local language (Cantonese or Mandarin) when conducting the interview.

MEASUREMENTS

Daily Activity Checklist (DAC)

Activity was investigated by a modified version of the questionnaire from Hultsch et al.’s longitudinal study (1993) (a modified version was used before in Jopp & Hertzog’s 2007 study). This daily activity checklist contained 48 items belonging to categories of physical activities (e.g., sports), social activities (e.g., visiting friends), and cognitive activities (e.g., reading). Prior to the study, the first author did an informal interview with the Chinese elderly to inquire about their daily activities. Based on this informal interview, a few other items were added to the original questionnaire. These items include helping to care for grandchildren or other children, playing mahjong, playing Tai-Chi, and going to a senior college, which are considered special leisure activities for the Chinese elderly people. The final version of the questionnaire included a total of 60 items. Participants were asked to check all activities they engaged in on a regular basis. A composite score, which ranged from the lowest score of 1 to the highest score of 60, represented the overall involvement of everyday activities from the participants.
The Attitudes to Aging Questionnaire (AAQ)

Laidlaw, Power, Schmidt, & WHOQOL-OLD Group’s *Attitudes to Aging Questionnaire* (Laidlaw, Power, & Schmidt 2007) was used to measure the elderly’s perception of aging. AAQ is a cross-cultural self-report measure consisting of three subscales, Psychological Loss (negative), Psychological Growth (positive) and Physical Health, and has been validated in 20 centers worldwide. For each subscale, there are eight items where participants indicated how they agreed with each item on a 5-point Likert scale, with a 1 representing “strongly disagree,” and 5 “strongly agree.” They could use any number in between to indicate their level of agreement with the statement. The Psychological Loss subscale includes items, such as “Old age is a depressing time of life” and “Old age is a time of loneliness,” indicating a negative attitude to aging. The Psychological Growth subscale includes items, such as “It’s a privilege to grow old” and “Wisdom comes with age,” indicating a positive attitude. The Physical Health subscale includes items such as “It is important to take exercise at any age” and “I keep as fit and active as possible by exercising,” indicating the elderly individual’s perception of physical change during aging. The reliability is .84 for the Psychological Loss subscale, .75 for the Psychological Growth subscale, .68 for the Physical Change subscale, and .86 for the overall scale (Laidlaw et al., 2007).

Translation and back-translation

The English version of the above two scales were first translated by the first author who is fluent with both English and Chinese. The second author, also bilingual in both Chinese and English, did the back-translation. Both authors then reevaluated the translation and made some changes in language to fit more to the participants.

Short Form Health Survey (SF-12)

The Chinese version of Short Form Health Survey (SF-12; Lam, Tse, & Gandek, 2005) was used to assess the current physical and mental status of the participants. SF-12 is a 12-item short form questionnaire originating from the SF-36 (Ware, Kosinski & Keller, 1996; Ware, Snow, Kosinski & Gandek, 1993). It is a well-established health functioning measurement (Gandek et al., 1998), and is valid and equivalent for the Chinese population (Lam et al., 2005). The 12 items encompass two physical functioning questions, two role limitation questions related to physical health, one body pain question, one perception of general health question, one energy/fatigue question, one social functioning question, two role limitation questions related to emotional problems, and two general mental health questions. Respondents were required to rate all 12 items, and would obtain two component summary scores of Physical Component Summary (PCS) and Mental Component Summary (MCS). PCS and MCS are computed based on the scoring algorithms and range from 0 to 100. Lower PCS or MCS scores indicate lower self-reported physical and mental health functioning and higher scores indicate higher levels of health. The Test–Retest Reliability is .89 for PCS, and 0.76 for MCS. The construct validity of SF-12 is 0.95 for PCS, and .96 for MCS, in correlation with their SF-32 counterparts (Ware et al., 1996).
Demographic Questionnaire

The demographic variables included items such as gender, age, ethnicity, education, family structure (number of offspring, frequency of visiting), occupation before retirement, years of retirement, source of retirement income, and religion.

Creativity measures

The current study took the product-orientated approach and the Consensus Assessment Technique (CAT) to measure creativity. There are two creativity tasks in two different domains, collage making (art domain) and storytelling (literature domain). For the collage making, each participant was given a package of stickers of different colors and shapes. The investigator instructed participants to choose one kind of emotion from four emotions (happy, sad, frightened, and angry), and make a collage to represent the chosen emotion. No time limit was set, but most participants were able to complete the task in less than 15 minutes. Similar tasks were used in previous studies (Niu & Liu, 2009; Niu & Sternberg, 2001). All collage designs were later scanned and stored for further assessment.

For the task of storytelling, each participant was asked to pick one or any combination of the numbers provided (1, 5, 8, and 9) or choose any other number they wanted and tell a story related to the selected number. They were also told that their stories were recorded for further analysis. There was no time limit to the storytelling; however, most participants were able to complete their stories in less than 5 minutes. All stories were recorded by electronic recorders and transcribed into a text format for rating.

JUDGING PROCEDURE OF CREATIVITY

Collage making

Three Chinese artists (two male artists and one female artist) with an average of 15 years in the field of art (painting, graphic design, and dancing, respectively) were recruited to serve as judges. All participants’ collage designs were scanned and photocopied and presented to the three Chinese artist judges. Judges were asked to evaluate each design according to overall creativity, based on their own subjective criteria. The evaluation process took place in three separate rooms where judges were apart from each other. Following the oral instruction from the principal investigator, judges first classified all collages into three groups based on the levels of creativity: high, moderate, and low, and further divided each group into two subgroups with one group being more creative than the other. A 6-point scale was used for classifying each subgroup, with 6 representing the most creative group and 1 representing the least creative group. This rating method was adopted in the previous research of creativity (Niu & Liu, 2009). After completion of their evaluations separately, all three judges were asked to come together to discuss their evaluations. They were then asked to make changes on their ratings they felt necessary. Their final ratings were later recorded to represent each of their ratings.
Storytelling

All stories were tape-recorded and transcribed. Three college Chinese language professors (one male professor and two female professors), who are experts in the field of Chinese language and familiar with story writing, were recruited to serve as judges to evaluate the overall creativity of all stories. They were informed that all these stories were told by a group of Chinese elderly aged between 50 and 92. The title for each story was marked on the top of the page. They were asked to use their own subjective criteria to make judgments using a 7-point scale, with a 1 representing the least creative, and 7 the most creative.

RESULTS

Interrater reliability was examined to determine whether the disagreement among different judges was at an acceptable level so that an average score across judges could be used to represent the participants’ overall creativity. Interrater reliability was .82 for the collage making, and .70 for storytelling, which was considered to be good and acceptable (respectively) as measured using the Cronbach’s coefficient alpha.

The correlation coefficient of the two domains of creativity was .375, significant at the .01 level (two-tailed), which was considered moderate, indicating creativity was somewhat consistent across different domains in this sample.

The correlation coefficients between the age of participants and their overall creativity in both domains were also calculated to examine the first hypothesis that there was an age-related difference in creativity. The correlation coefficient between age and creativity was −.313 in the collage making domain and −.264 in the storytelling domain, both significant at the 0.1 level, indicating a significant negative relationship between aging and creativity. While controlling for the influences of education and gender, the associations between age and creativity remained significant in the art domain (r = −.191) at the p < .05 level, and borderline significant in the literature domain (r = −.146) at the p < .1 level, from which we could conclude that age alone would be an important predictor of creativity.

To examine the association of various other individual factors and creativity, Pearson’s correlations were computed to explore the relationship between the two creativity scores and all individual variables, including gender, age, marital status, education, physical health, mental health, daily activities, and attitude toward aging. As shown in Table 1, most of these variables were significantly associated with creativity in both domains. The most significant factors include (1) education (r = .337 for art; r = .311 for literature); (2) physical health (r = .303 for art; r = .227 for literature); (3) mental health (r = .182 for literature); (4) daily activities (r = .316; r = .383); (5) attitude toward aging: psychological loss subscale (r = −.375; r = -.352) and physical health subscale (in Storytelling domain alone, r = .173). No other demographic factors were found to be significantly associated with creativity in either domain.
HIERARCHICAL MULTIPLE REGRESSION ANALYSIS

We focused on the variables that appeared to be significant predictors of creativity and performed two hierarchical multiple regressions to determine their relative contributions to creativity. The demographic variable of age was entered as the first block, followed by the variable of education background of participants. The third block of variables included mental and physical health status of participants (in collage design domain, physical status alone). The fourth block included the behavioral variable of daily activities and the psychological variable of attitudes toward aging (in collage design domain, psychological loss subscale alone; in storytelling domain, psychological loss, and health change subscales were included).

In the domain of art, most of these variables exerted unique contributions to creativity (see Table 2). More specially, age alone explained 10.8% of the total variance of creativity (p < .0001), whereas education explained an additional 4.6% (p = .009), physical health explained an additional 6.9% (p = .001), and daily activities and psychological loss subscale together explained the additional 3.8% (p = .041).

For the domain of literature, our results were similar with the art domain creativity (see Table 3). Age accounted for 8.3% variance of the literature domain creativity.

TABLE 1. Correlations among Overall Creativity and Individual Variables

<table>
<thead>
<tr>
<th></th>
<th>Collage design</th>
<th>Storytelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.313**</td>
<td>-.264**</td>
</tr>
<tr>
<td>Gender</td>
<td>-.115</td>
<td>-.058</td>
</tr>
<tr>
<td>Education</td>
<td>.337**</td>
<td>.311**</td>
</tr>
<tr>
<td>Physical status</td>
<td>.303**</td>
<td>.227**</td>
</tr>
<tr>
<td>Mental status</td>
<td>.113</td>
<td>.182*</td>
</tr>
<tr>
<td>Daily activities</td>
<td>.316**</td>
<td>.383**</td>
</tr>
<tr>
<td>Attitude toward aging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological Loss</td>
<td>-.375**</td>
<td>-.352**</td>
</tr>
<tr>
<td>Psychological growth</td>
<td>.056</td>
<td>.104</td>
</tr>
<tr>
<td>Physical health</td>
<td>.078</td>
<td>.173*</td>
</tr>
</tbody>
</table>

Note.  *p < 0.05 (two-tailed).  **p < 0.01 (two-tailed).

TABLE 2. Individual Difference in Artistic Creativity

<table>
<thead>
<tr>
<th>Model</th>
<th>R square</th>
<th>R square changes</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.101</td>
<td>.108</td>
<td>.000</td>
</tr>
<tr>
<td>Education</td>
<td>.141</td>
<td>.046</td>
<td>.009</td>
</tr>
<tr>
<td>Health status</td>
<td>.205</td>
<td>.069</td>
<td>.001</td>
</tr>
<tr>
<td>Daily activity &amp; attitude toward aging</td>
<td>.232</td>
<td>.038</td>
<td>.041</td>
</tr>
</tbody>
</table>
(p = .001), whereas education accounted for an additional 4.8% variance (p = .008),
health accounted for an additional 6.5% variance (p = .006), and daily activities and
attitude toward aging variables accounted for an additional 6.2% variance
(p = .016).

DISCUSSION

The results of the current study demonstrated that overall creativity showed age-
related impairment in the Chinese elderly sample, which was consistent with
findings from previous studies (e.g., Alpaugh & Birren, 1977; Alpaugh et al., 1982;
McCrae et al., 1987). As expected, age alone accounted for the largest individual dif-
fferences in creativity. On the other hand, it is not surprising to see that education
and general health were also related to creativity and accounted for a moderate
portion of the variance in individual differences in creativity performance (e.g.,
Flood, 2007; Perlmutter & Nyquist, 1990; Ruth & Birren, 1985). Based on this
finding, it is clear that older Chinese adults with a better educational background
and good health practices are at lower incidence of reduced creativity.

Unlike relatively more stable factors, such as age, education, and health status,
behavioral and psychological variables are more malleable and subject to change by
personal effort. Consistent with the second objective of our study, correlation analy-
sis and hierarchical regression analysis confirmed that higher levels of participation
in activity and positive attitude toward aging were associated with greater creativity
performance. This finding was also consistent with other studies, in which involve-
ment in everyday activities was found to lead to a lower risk of global cognitive
functional decline (e.g., Hultsch et al., 1999; Jopp & Hertzog, 2007; Leung et al.,
2011; Wang et al., 2006).

The findings from this study have real-world implications. First, it is important
to know that even though age does contribute to the decline in creativity among
post-retirement, it is up to the individual to retain his or her creativity and be more
successful and enriched with age. Daily activities that are cost-effective and low-risk
can have a significant impact on the creativity in one’s later life. For this reason,
more intervention programs that aim at promoting activity in older people should
be recommended and introduced into this community. Similar to daily activity, it is
crucial to encourage the elderly to reduce negative beliefs of aging and to view aging
as a rewarding experience. Traditional Chinese culture has respected the contribu-
tions of elderly; however, with the economic growth and globalization, the social

<table>
<thead>
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<th>Model</th>
<th>R square</th>
<th>R square changes</th>
<th>Sig</th>
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<tbody>
<tr>
<td>Age</td>
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<td>.083</td>
<td>.001</td>
</tr>
<tr>
<td>Education</td>
<td>.118</td>
<td>.048</td>
<td>.008</td>
</tr>
<tr>
<td>Health status</td>
<td>.172</td>
<td>.065</td>
<td>.006</td>
</tr>
<tr>
<td>Daily activities &amp; attitude toward aging</td>
<td>.218</td>
<td>.062</td>
<td>.016</td>
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</table>
status of older people is changing rapidly (Chiu & Yu, 2001). Age stereotypes start to develop in childhood, and are transformed into self-stereotypes in older age (Levy, 2009). There is a great potential benefit for popularizing respect for the elderly in Chinese early education.

There are few areas that can be further expanded and developed. First, the sample size of the current study was relatively small and limited. Future studies should select a larger and more representative sample to further explore the various factors of creativity among the aging population. Second, as the current study only explored the general impact from participation in activities, additional studies are needed to unravel the distinct effects of different activities on creativity (e.g., Hall et al., 2001; Lövdén et al., 2005; Wilson et al., 2005). Third, although some individual factors, such as demographics, health, behavioral, and psychological variables, have been explored in this study, many other determinants of aging cognition were not measured, such as personality (Andrews, Clark & Luszcz, 2002), and self-efficacy (Jopp & Rott, 2006). Fourth, as China is a developing country with a growing aging population, the current study was one of few studies filling in the gap between theories and research of exploring cognition and its determinants in the older Chinese population. This study should shed a little light on this demographic and encourage future research on the older Chinese population. Finally, it should be noted that as the data from this study was based on Chinese populations; generalizing the findings to Western cultures should be performed with extreme caution.

REFERENCES


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