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# The Establishment of the Chinese Version of the Vviq (Vviq-C) and the Effects of Age and Gender on the Vividness of Visual Imagery

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## Abstract

**Background:** The relationship between vividness of Visual Mental Imagery (VMI) and factors such as age and gender is poorly understood. We developed a Chinese version of the Visual Vividness Imagery Questionnaire (VVIQ), labelled VVIQ-C, and assessed its reliability.

**Methods:** VVIQ-C was developed, and its reliability was assessed. Using the VVIQ-C, we investigated individual vividness differences in 1,015 Chinese participants and explored the proportions of low and high vividness scorers in teenager (< 18 years old), younger (18-29 years old) and middle-aged adults (30-60 years old) of different gender.

**Results:** The reliability of VVIQ-C is high. Also, there were no significant differences in VVIQ-C median scores across different age groups and genders. However, the distribution of low vividness and high vividness group varied across different age groups, and this variation differed between women and men.

**Conclusions:** There might be a potential impact of age and gender on VMI abilities in Chinese population.

**Keywords:** Imagery; Age; Age Groups; Gender; Culture; VVIQ

## Introduction

Visual Mental Imagery (VMI) refers to the human ability to recall objects or scenes to the mind's eye and manipulate visual representations without external stimulation [1, 2]. VMI is closely linked to several other cognitive functions, including visual memory [3], spatial navigation [4], and decision-making [5, 6]. Vividness is a significant aspect of VMI. It represents the clarity, colourfulness and liveliness of an individual's mental image of objects or scenes [7, 8]. The Vividness of Visual Imagery Questionnaire (VVIQ; [7]) is widely used to measure the vividness of mental images. It consists of 16 five-answer multiple-choice items, each worth a range from 1 to a max of 5 points (total score range: 16-80), whereby participants subjectively rate the vividness of their mental images based on given instructions (e.g., imagining a country scenario and rating the vividness of the lake's colour and shape). Previous studies have demonstrated the high reliability [9, 10] and validity [10] of the VVIQ. [11] suggested that VMI abilities can be objectively indicated by binocular rivalry (BR) tests [11]. BR occurs when conflicting images are simultaneously presented to corresponding areas of each eye, and this contradiction leads the observer to perceive only one image at a time, with perceptual experience alternating over time [12]. Pearson found that longer periods of imagery led to stronger bias effects, and these effects were highly specific to the orientation and location of the imagined pattern.

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[11]. Researchers have also conducted studies related to VMI capabilities by utilizing BR [13, 14].

VMI abilities vary among individuals based on VVIQ scores [15]. M.X., who subjectively reported a loss of his VMI ability showed an extremely low VVIQ score and significant differential cortical activation compared to matched controls when tasked with generating mental images [16]. Several other cases have also been reported of individuals with low VVIQ score [16-19]. This condition has been labelled "Aphantasia" [20]. People with Aphantasia also reported experiencing poor visual imagery in their dreams and having impoverished autobiographical memory or face recognition [16, 17, 21, 22]. The proportion of individuals with low vividness in the general population varies in different studies as well as different standards [15] from 0.7 ([16] - VVIQ score ≤ 23), 3.7 ([23] - VVIQ score ≤ 32) to 3.90% ([24] – VVIQ score ≤ 32). On the other side of the spectrum, Hyperphantasia refers to the ability of individuals to elicit extremely vivid visual images in their mind's eye [16] assessed a sample of 2000 people estimating the frequency of Hyperphantasia (defined as a score > 75/80 on the VVIQ) in 2.50% of the general population. However, according to [25], Hyperphantasia should refer only to those with extremely high VVIQ score (VVIQ score = 80) indicating a "perfectly clear and very vivid" image on every single item of the 16 composing the questionnaire. Obviously, the prevalence of Aphantasia and Hyperphantasia would depend on several variables, including the cut-off chosen, the way data are collected as well as demographics factors. A cross-sectional study using the Hungarian version of VVIQ found that VMI abilities decline through the lifespan [26]. [16] reported that both Aphantasia and Hyperphantasia were more frequent in younger people. [27] found that performance on the VVIQ increases in teenagers, starting around ages 8-9 in women and 10-11 in men, while stabilizing beyond the age of twelve. It remains unknown whether this finding is attributable to the developing of language comprehension abilities necessary to understand the task or if it truly reflects an imagery-related effect. Another demographic variable that could affect performance on the VMI is gender. [26] as well as [28] observed no gender differences in VMI ability, while others found a bias in the Hyperphantasia group towards women [16]. Despite its wide use and the value of the VVIQ as a tool for assessing VMI, a Chinese version is not available. Considering cultural differences, it is essential to establish a Chinese version of the VVIQ to examine how VMI abilities change across different age groups and to assess extremes of VMI abilities in the Chinese population. The aim of the present study was to develop a Chinese version of the VVIQ (VVIQ-C) and evaluate its reliability. Additionally, we aimed to explore if VMI abilities as well as the proportions of low and high vividness individuals change with age or gender.

## Study 1: VVIQ-C - Validation study

### Method

#### Participants

A total of 297 healthy individuals (187 women) were recruited online to assess the reliability of the VVIQ-C. The participants were divided into three age groups: 125 younger adults (age 18-29 years; M = 26.28, SD = 1.83, 76 women), 100 middle-aged participants (age 30-60 years; M = 38.90, SD = 7.91, 60 women), and 72 older adults (age > 60 years; M = 65.53, SD = 6.09, 48 women). All participants were re-invited around three months after the first assessment to take part in a re-test session; 65 individuals agreed (30 women; age range: 18-65 years old, M = 28.60, SD = 11.02). Another 102 healthy participants (age range: 15-30; M = 20.85, SD = 2.33; 67 women) were recruited offline for the evaluation of the validity of VVIQ-C. The participants were divided into two age groups: 20 teenagers (age 15-18 years; M = 16.60, SD = 0.60, 12 women), 82 younger adults (age 18-30 years; M = 21.89, SD = 2.71, 55 women) Criteria for inclusion were: no history of neurological or psychiatric disorders, no learning disabilities, normal or corrected-to-normal vision, being right-handed. The study was approved by the Shanghai Jiao Tong University ethics committee (No.: B202302001), and conducted in accordance with the Helsinki Declaration; informed consent was obtained from all participants after providing them with a detailed description of the study.

#### VVIQ to VVIQ-C: Translation and transcultural adaptation

The translation and trans-cultural adaptation of the VVIQ-C followed established recommendations in the literature to ensure conceptual equivalence [29]. The process involved six steps: Step 1: Two native Chinese-speaking translators independently translated the VVIQ into Chinese. Step 2: The two translators compared their translations and reached a consensus to generate an agreed version. Step 3: A back-translation of the agreed-upon VVIQ-C was performed by two native English translators who were blinded to the original and had no prior knowledge of medical topics. Step 4: A committee of five members reviewed the translations and back-translations to develop a final version of the VVIQ-C. Step 5: The final version was given to 297 participants who completed an online version of the questionnaire.

### VVIQ-C

The VVIQ-C consists of four scenarios (e.g., "A relative or friend you often see" or "A country scene with trees, mountains, and a lake") and participants were instructed to represent the corresponding scenarios in their minds' eyes. For each scenario, four questions are asked about specific aspects of the scene (e.g., "The colour and shape of the trees"). Participants were required to rate the vividness of the

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objects or scenes generated in their mind on a scale ranging from 1 (no image at all) to 5 (perfectly clear and very vivid). The entire questionnaire consists of a total of 16 questions, resulting in a possible total score ranging from 16 (lowest score) to 80 (highest score).

**BR test (evaluation of validity)**

The BR test is used to objectively assess participants VMI abilities in order to evaluate the validity of the VVIQ-C. The BR experiment program was written in Psychopy and took place in a darkened room. All BR stimuli in all experiments are presented from the same monitor, which is positioned 58cm away from the participant. Participants make judgments using a keypad located 35cm from them. BR paradigm consists of the green horizontal and red vertical grating, both presented inside of an annulus surrounding the central fixation point. The size of the grating image is 1000 by 1000 pixels, containing 10 of each type of grating, with a width of 50 pixels for each grating (see Figure 1). The initial contrasts of the red and green gratings are both 50%. In the formal BR test, a central cue ("G" or "R") was presented at the beginning of each trial to indicate whether subjects should form a mental image of a green horizontal grating or a red vertical grating, respectively. This was followed by a 6-s imagery period, during which participants were instructed to imagine the appropriate grating. Next, participants were presented with either the binocular rivalry display (75% of all trials) or a mock rivalry display (25% of all trials) for 750 ms. On binocular rivalry trials, the green vertical grating was shown to the left eye and the red horizontal grating was shown to the right eye. Participants pressed one of three assigned buttons on a keyboard to indicate whether they primarily saw the green horizontal grating, the red vertical grating, or an approximately equal mixture of the two as a result of binocular combination or piecemeal rivalry. At last, participants were cued to report the vividness of their imagery on that trial by pressing one of four keys (1 = almost no imagery, 2 = some weak imagery, 3 = moderate imagery, 4 = strong imagery almost like perception). The procedure of the BR test is depicted in Figure 1.

Before the formal BR test, participants are required to undergo primary eye adjustment and practice experiment. Primary eye adjustment is utilized to assess whether participants exhibit the dominance of one eye, i.e., whether they overly rely on images seen by one eye. Participants view BR images and make color judgments by pressing keys for 10 trials. If a participant judges a certain color for a high number of times (7 times or more), the contrast of this color grating will be reduced by 2%. After up to 10 such adjustments, if the subject still exhibits the dominant eye effect, the subject will be excluded from this experiment. The mock trial for grating BR is divided into three parts: the ones with red-vertical grating occupies 75% of the images; ones with green-horizontal grating occupies 75% and the ones consist of 50% each. Each of the three types of patterns made up of 1/3 of the total number of mock trials. Mock trials account for 25% of the total trials in the formal BR experiment. The role of mock trials is to assess whether participants base their judgments in the BR test on observation or decision bias. If the accuracy of mock trials is below 50%, it indicates that participants rely more on decision bias than observation to complete the BR

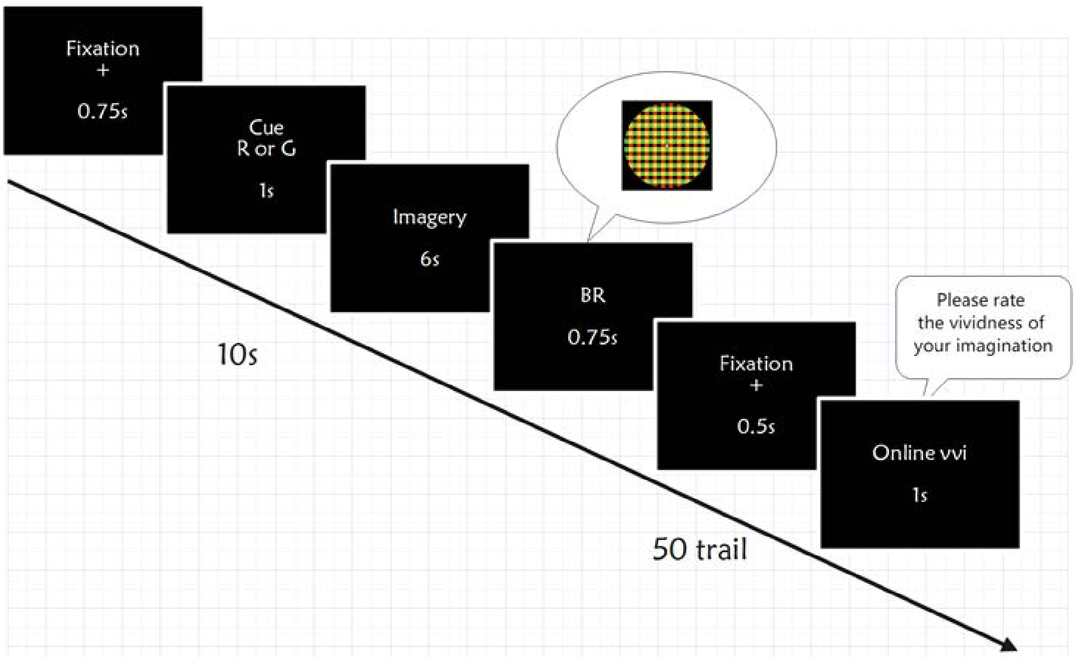


**Figure 1:** The procedure of the BR test

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test. Data from these participants will be excluded from the analysis.

### Data analyses

Cronbach's alpha was calculated to assess internal consistency for the overall score of the VVIQ-C. Split-half reliability was evaluated by dividing the sequence numbers of the questionnaire items into odd and even numbers. Test-retest reliability was determined using data from a sub-sample of 65 participants tested twice by the same experimenters with an average interval of 3 months. Cronbach's alphas, split-half reliability, and test-retest reliability were calculated by using Pearson's correlation coefficient. According to [30], a questionnaire's reliability should be above 0.7 to be considered acceptable, and should exceed 0.8 to be deemed good. As the VVIQ-C does not consist of subscales, we calculated the Cronbach's alpha only for the total score.

The percentage of trials in which perception of the binocular rivalry display was biased in favor of the imagined grating pattern (prime effect) is calculated to assess participants' VMI ability. The Pearson correlation between participants' scores in the VVIQ-C and the prime effect in completing the BR test is calculated to evaluate the validity of the VVIQ-C. The Pearson correlation coefficient was computed among all participants, teenagers, and younger adults.

## Results

The Cronbach's alpha for the VVIQ-C total score was .92 and the split-half reliability was .82, indicating VVIQ-C has a high internal consistency. The test-retest reliability was .93. This result suggests that VVIQ-C has high reliability (Paap and Sawi, 2016). Meanwhile, among all participants, the Pearson correlation coefficient between the prime effect in BR test and VVIQ-C scores was 0.362, $p = 0.002$. Among teenagers, the Pearson correlation coefficient between the prime effect in BR test and VVIQ-C scores was 0.586, $p = 0.007$. Among younger adults, the Pearson correlation coefficient between the prime effect in BR test and VVIQ-C scores was 0.254, $p = 0.021$. This indicates that the VVIQ-C also exhibits a high level of validity. Given the age range of the participants enrolled in the present feasibility study, the VVIQ-C can be administered to different age groups. The VVIQ-C is made freely available and can be downloaded from this website: https://aphantasia.sjtu.edu.cn/vividnesstest.

## Study 2: Demographics effects on the VVIQ-C

### Method

### Participants

A total of 1232 participants were recruited for the study. 196 participants were excluded from the final analyses due to not having completed the experiment or to missing information. Moreover, data from older participants (over 60) were not considered in the analysis due to the limited sample size (n = 21). As a result, the data from 1,015 (583 women) participants were considered for the analyses. To explore VMI abilities in different age groups, the participants were divided into three groups: teenagers (age 8-17), younger adults (age 18-29), middle-aged adults (age 30-60). For the final analyses, data were considered from 363 teenagers (184 girls; age range: 8-17, M = 15.16, SD = 2.00), 458 younger adults (295 women; age range: 18-29, M = 21.82, SD = 2.81), and 194 middle-aged adults (104 women; age range: 30-60, M = 37.62, SD = 7.56). Detailed demographics can be found in Table 1.

Selection criteria were the same as in the validation study (above). For teenage participants, informed consent was obtained from their guardians. The study protocol was approved by the ethics committee at Shanghai Jiao Tong University (No.: H20230182I) and conducted in accordance with the Helsinki Declaration to ensure the protection and ethical treatment of the participants. To compensate for their time and effort, participants received an honorarium of 50 yuan per hour.

**Table 1:** Detailed demographics and median VVIQ-C scores of participants to Experiment 2, according to gender and age

| Gender | n (%) | Median VVIQ-C score |
|---|---|---|
| Men | 432（42.56） | 62.50 |
| Women | 583（57.44） | 65.00 |
| **Age Group** | | |
| Teenagers ( < 18 years old) | 363（35.76） | 65.00 |
| Younger adults (18-29 years old) | 458（45.12） | 63.00 |
| Middle-aged adults (30-60 years old) | 194（19.11） | 64.00 |

### Experiment procedure

Participants were tested in person and individually, and completed the VVIQ-C. Data from participants of different age groups were collected by different experimenters at the same location but at different times[1]. The recruitment materials did not mention VMI or the concepts of low vividness ('Aphantasia') or high vividness ('Hyperphantasia'), ensuring that participants were unaware of the specific research goals when agreeing to participate. This approach aimed at preventing any biased inclusion of individuals with unusual imagery phenomenology or extreme vividness.

[1]Kruskal-Wallis test was applied on VVIQ-C score distribution and revealed no significant difference across experimenters, z = 5.36, p = 0.147, suggesting that the homogeneous of different experimenters in data collection in the current sample.

**Data analyses**

**Age and Gender Differences in VVIQ-C Scores**

Given the skewed distribution of the VVIQ-C scores in our sample (skewness = -0.78, Kurtosis = 0.99, p < 0.001), the median scores of VVIQ-C are calculated for different age and gender groups. Mann-Whitney test was used to compare the median VVIQ-C scores between genders. Kruskal-Wallis test was carried out to assess differences in median VVIQ-C scores among different age groups.

### Proportions of low and high vividness across gender and age groups

The proportions of low vividness (VVIQ-C ≤ 32/80) and high vividness (75/80 ≤ VVIQ-C) participants were calculated separately for each age group. The number of individuals achieving the lowest score (VVIQ-C = 16, Aphantasia) and the highest score (VVIQ-C = 80, Hyperphantasia) on the VVIQ-C, as well as their proportion in the overall sample, were also calculated. Chi-square tests were first employed on the proportion of lower and higher vividness separately across gender to explore the distribution of lower and higher vividness groups in different gender. To explore age difference, chi-square tests were applied on the proportion of lower and higher vividness groups separately using age (teenagers, younger, middle-aged groups) as a between-subject factor. Chi-square tests were performed on the proportion of lower and higher vividness population respectively considering age (teenagers, younger, and middle-aged adults) and gender (men vs. women) to further address the question whether gender influences the distribution of low and high vividness in different age groups. Pairwise comparisons were further applied to explore the differences in proportions of low vividness and high vividness between each pair of age groups if necessary.

## Results

One individual (man, 16 years old) demonstrated the lowest VVIQ-C score of 16 (Aphantasia), representing 0.10% of the total sample of 1015. Twenty lower vividness individuals (8 women; age range: 9-40; M = 18.03, SD = 6.37), representing 2.00% of our sample were detected with low VVIQ-C scores (VVIQ-C ≤ 32/80). Forty-nine individuals obtained the highest VVIQ-C score of 80 (Hyperphantasia), representing 4.83% of the total sample. A total of 160 individuals (90 women; age range: 8-57; M = 20.65, SD = 8.62) representing 15.76% of the total sample scored high on VVIQ-C (75/80 ≤ VVIQ-C).

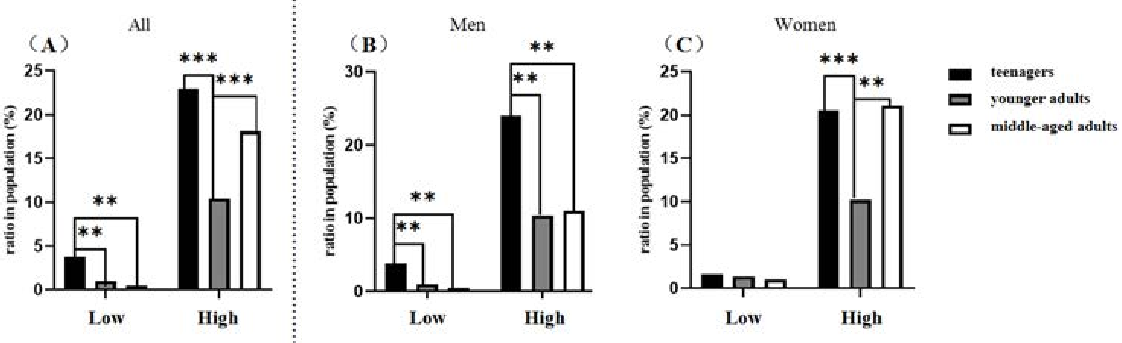
### VMI and age

The Kruskal-Wallis test was applied on VVIQ-C median scores and revealed no significant differences across age groups, z = 3.73, p = 0.15. VVIQ-C scores were comparable in teenagers (median = 65.00), younger (median = 63.00) and middle-aged adults (median = 64.00). However, the distribution of the scores differed; in fact, a significant age effect was observed in the proportions of lower vividness group (Fig.2A), $\chi^2 = 10.64$, p = 0.005. The proportion of lower vividness in teenagers (3.80%) was significantly higher than that in younger (1.00%) and middle-aged adults (0.50%), both $\chi^2 s \geq 5.39$, ps ≤ 0.009 (see Fig. 2). No significant difference in the proportion of lower vividness was detected between the younger and middle-aged adult groups, $\chi^2 = 0.50$, p = 0.48. The proportion of higher vividness scores on the VVIQ-C participants also varied with age (Fig.2A), $\chi^2 = 21.56$, p < 0.001; it was higher among teenagers (23.00%) and significantly lower in younger adults (10.40%), $\chi^2 = 21.41$, p < 0.001. Such proportion was 18.10% among middle-aged adults, differing from that of the younger adults, $\chi^2 = 7.01$, p = 0.008. No significant difference in the proportion of higher vividness was detected between the teenagers and middle-aged adult groups, $\chi^2 = 1.40$, p = 0.24.

### VMI and Gender

No significant gender difference emerged between men (median = 62.50) and women (median = 65.00) in VVIQ-C

**Figure 2:** Proportion of lower vividness and higher vividness in different age group: teenagers (age 8-17), younger adults (age 18-29), and middle-aged adults (age 30-60) in (A) Whole sample, (B) Men and (C) Women




Key: Low: lower vividness; High: higher vividness
**: p ≤ 0.01, ***: p ≤ 0.001

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median scores. A Chi-square test revealed no significant differences in the prevalence of lower vividness between men (n = 12; 2.78%) and women (n = 8; 1.37%), in the overall sample, $\chi^2 = 2.54$, p = 0.11. In addition, there was no significant differences in gender group, $\chi^2 = 0.11$, p = 0.74, with 16.20% men (n = 70) and 15.44% women (n = 90) reported with high VMI abilities. A significant age effect was observed in lower vividness group in men participants (Figure 2B), $\chi^2 = 12.92$, p = 0.002. The proportion of lower vividness was significantly higher in men teenagers (6.10%) compared to younger (0.60%) and middle-aged men population (0.00%), both $\chi^2s \geq 5.77$, ps ≤ 0.009). Conversely, no such age difference was observed in lower vividness group in women (Figure 2C), $\chi^2 = 0.22$, p = 0.895. The proportions of lower vividness were comparable in each age group (about 1.00%) (teenagers: 1.60%; young: 1.40%; middle-aged: 1.00%).

As can be seen in Figure 2B and 2C, the proportions of higher vividness participants in each age groups changed with gender as well. A significant age effect was found in the men group for higher vividness, $\chi^2 = 13.81$, p = 0.001. The proportion of higher vividness in men teenagers (24.00%) was significantly higher than that in younger (11.00%) and middle-aged adults (10%), both $\chi^2s \geq 7.55$, ps ≤ 0.006). Though a significant age effect was also observed in women for higher vividness ($\chi^2 = 12.71$, p = 0.002), a different pattern was observed compared to men. The proportion of higher vividness in women younger adults (10.20%) was significantly lower than that in teenagers (20.60%) and middle-aged adults (21.10%), both $\chi^2s \geq 8.19$, ps ≤ 0.004.

## Discussion

In the present study, the Chinese version of VVIQ (VVIQ-C) was established. It has been shown to have high reliability across a range of age groups, from teenagers to older adults. Using the BR test, we also found that VVIQ-C demonstrates high validity. The BR test is a commonly used objective measure in the field of VMI, making the validity results obtained through the BR test highly reliable. Given that the validity experiments for VVIQ-C recruited participants across various age groups, from teenagers to younger adults, VVIQ-C shows good validity across these age ranges, therefore can be used as a measurement for VMI abilities in the Chinese population across a range of age groups.

Using the VVIQ-C, we explored VMI abilities, as well as the two extreme populations of VVIQ scorers with lower and higher vividness, in a sample of 1,015 Chinese individuals considering age and gender.

### The high proportion of high vividness individuals

The proportion of Aphantasia (VVIQ-C = 16) and lower vividness individuals (VVIQ-C ≤ 32/80; 2.00%) in the population found in our study is roughly consistent with previous research (0.7%; [16]; 3.70%-3.90%; [23, 24]). About Hyperphantasia, we observed that 15.76% of participants had relatively higher VMI abilities (75/80 ≤ VVIQ-C) and 4.3% of the total sample presented with Hyperphantasia (VVIQ-C = 80). These proportions are much higher than those of 2.50% reported in [16]. One difference concerned the way data were collected, predominantly online by [16], individually by completing a paper-based version of the VVIQ-C in the current study.

To check this hypothesis, we tested the effect of data collection format (online vs. in person) on VVIQ-C score distribution by comparing the data distribution between Experiment 1 (validation study online) and Experiment 2 (in person). There was also a high proportion (9.43%) of Hyperphantasia (VVIQ-C = 80) as well as a high proportion of individuals with higher VMI abilities (25.93%) (75/80 ≤ VVIQ-C) than in previous reports [16]. These results suggest that the higher proportion of Hyperphantasia in our sample may not result from mode of testing.

The inconsistent results observed in our sample compared to Zeman et al.'s may due to cultural differences. Perhaps individuals in the Chinese cultural context are more inclined to report higher scores on the VVIQ-C. This would make the Chinese version of the VVIQ even more relevant. In particular, given the subjective nature of the VVIQ, this difference could be traced back to individuals' metacognition on VMI abilities. [31] stated that there are wide individual differences in VMI metacognition, the awareness and ability to evaluate one's own vividness of episodes of imagination. They used an adapted binocular rivalry (BR) test and showed that VMI could be modulated by exposure. Therefore, the observed VMI abilities, measured by VVIQ-C, which is a subjective measure, might be related to VMI metacognition rather than VMI abilities per se. It has been suggested that cultural difference is a key factor influencing metacognition [32]. Accordingly, Chinese cultural contexts could induce higher levels of VMI metacognition than western cultures. Future research should be conducted to assess this hypothesis by exploring VMI metacognition in different culture backgrounds.

### VMI and age

There was no significant effect on VVIQ-C scores across different age groups, suggesting that VMI abilities may not vary with age. This finding contrasts with the observation by Gulyás et al. (2022) as they found a decline in VMI abilities with increasing age. Although both studies investigated VMI abilities across different age groups using a cross-sectional design, several differences should be noted that could explain these contrasting findings. Firstly, the cultural differences between the Hungarian and Chinese populations could contribute to these disparate results. Additionally, it is important to consider the different data analysis approaches used in the two studies. In the present study, due to the

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skewed distribution of the sample, the median score of the VVIQ-C was calculated and analyzed. [26] instead employed the mean score of the VVIQ for their data analysis.

As shown in Figure 2A, however, the relative proportions of lower vividness and higher vividness varied with age; the extremes being more frequent within the teenager group, confirming [16] observation that both Aphantasia and Hyperphantasia were more frequent in younger people. These findings suggest that the occurrence of extremely poor or highly vivid imagery, could be accounted for in part by the stage of cognitive development in teenagers. This aligns with Haber's hypothesis (1979) on cognitive domain development, which suggests that VMI abilities are malleable during the teenage years and may be modulated or diminished as part of normal developmental processes. No statistical difference was observed between younger and middle-aged adults in the proportion of lower vividness. This may suggest that VMI abilities tend to be stable during adulthood. However, the proportion of high vividness was significantly higher in middle-aged adults (30-60 years old) compared to younger adults (18-29 years old) (see Figure 2A). This may suggest that the condition of higher vividness could still change in the period after young adulthood.

### VMI and gender

Consistent with previous observations [28, 26], there were no gender differences in VVIQ-C median scores in the present study. Furthermore, the proportions of lower vividness and higher vividness did not differ by gender. However, the proportion of lower vividness in women remained relatively stable across different age groups (Figure 2C), whereas in men it decreased with age (Figure 1B), suggesting that cognitive immaturity, manifesting as lower vividness, is not time wise equal across genders.

There was a significantly smaller proportion of higher vividness in younger women compared to middle-aged women (Figure 2C), whereas there was no significant difference between younger and middle-aged men (Figure 2B). It is possible that Chinese women in their middle-aged phase are more inclined to enhance their VMI abilities to cope with the negative emotions brought about by the pressures of living standards and societal demands, whereas men adopt other strategies to deal with life stress [33].

It is also possible that individuals' metacognition of VMI abilities change with age or differ for gender, rather than their VMI abilities per se [34]. In addition, metacognition may be influenced by emotions [35]. The different emotions experienced by individuals of different ages and genders may impact metacognition, further affecting VVIQ-C scores. Future studies could explore how VMI abilities and VMI metacognition change with age in men and women in different geographical areas, as well as whether and how emotions affect metacognition for VMI.

## Limitations

Despite the significant findings of our study, it is important to acknowledge some limitations. Firstly, we failed to recruit a sizeable sample of older participants; hence, we were unable to comprehensively evaluate the distribution of individuals with different VMI abilities across the entire lifespan. Secondly, we did not measure directly metacognition for one's own VMI abilities, nor did we collect emotion measurements of our participants. Therefore, we are unable to draw firm conclusions regarding the association between these variable and VVIQ-C scores. Future research could incorporate metacognitive measures and objective VMI test as well as emotion measurements to investigate the relationship between VMI abilities, metacognition, emotion, gender and age.

## Declarations

### Ethics approval and consent to participate

The study protocol was approved by the ethics committee at Shanghai Jiao Tong University (No.: H20230182I) and conducted in accordance with the Helsinki Declaration to ensure the protection and ethical treatment of the participants. Informed consent was obtained from all subjects and/or their legal guardian(s). To compensate for their time and effort, participants received an honorarium of 50 yuan per hour.

## Consent for publication

Received consent from participants to publish.

## Availability of data and materials

The data that support the findings of this study are openly available in OSF at https://osf.io/ck87w/.

## Competing Interest

The authors declare no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Authors' contributions

Z.Z. is responsible for Methodology, Formal analysis, Investigation, and Writing Original Draft. Y.L. is responsible for a portion of Writing Original Draft, Visualization and Investigation. J.Y. is responsible for Investigation, and Data Curation. C.L. is responsible for Supervision. D.M. and S.DS. are responsible for Manuscript Review & Editing. B.Z. is responsible for Conceptualization, Manuscript Review & Editing, Supervision, Project administration and Funding acquisition.

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## References

1. Ganis G, Schendan HE. Visual imagery. Wiley Interdisciplinary Reviews-Cognitive Science 2 (2011): 239-252.
2. Pearson J. The human imagination: The cognitive neuroscience of visual mental imagery. Nature Reviews Neuroscience 20 (2019): 10.
3. Albers A M, Kok P, Toni I, et al. Shared representations for working memory and mental imagery in early visual cortex. Current Biology: CB 23 (2013): 1427-1431.
4. Ghaem O, Mellet E, Crivello F, et al. Mental navigation along memorized routes activates the hippocampus, precuneus, and insula. NeuroReport 8 (1997): 739.
5. Imbriano G, Sussman T J, Jin J, et al. The role of imagery in threat-related perceptual decision making. Emotion 20 (2020): 1495-1501.
6. Lee S, Parthasarathi T, Cooper N, et al. A neural signature of the vividness of prospective thought is modulated by temporal proximity during intertemporal decision making. Proceedings of the National Academy of Sciences of the United States of America 119 (2022): e2214072119.
7. Marks D F. Visual imagery differences in the recall of pictures. British Journal of Psychology 64 (1973): 17-24.
8. Marks D F. Phenomenological Studies of Visual Mental Imagery: A Review and Synthesis of Historical Datasets. Vision 7 (2023a): 67.
9. McKelvie S J. The VVIQ as a psychometric test of individual differences in visual imagery vividness: A critical quantitative review and plea for direction. Journal of Mental Imagery 19 (1995): 1-106.
10. Marks D F. The Action Cycle Theory of Perception and Mental Imagery. Vision 7 (2023b).
11. Pearson J, Clifford C W G, and Tong F. The Functional Impact of Mental Imagery on Conscious Perception. Current Biology 18 (2008): 982-986.
12. Blake R, Brascamp J, and Heeger D J. Can binocular rivalry reveal neural correlates of consciousness? Philosophical Transactions of the Royal Society B: Biological Sciences (2014).
13. Pearson J, Rademaker R L, and Tong F. Evaluating the Mind's Eye: The Metacognition of Visual Imagery. Psychological Science 22 (2011): 1535-1542.
14. Keogh R, Pearson J, The blind mind: No sensory visual imagery in aphantasia. Cortex 105 (2018): 53-60.
15. Pearson J, Naselaris T, Holmes E A, et al. Mental Imagery: Functional Mechanisms and Clinical Applications. Trends in Cognitive Sciences 19 (2015): 590-602.
16. Zeman A, Milton F, Della Sala S, et al. Phantasia–The psychological significance of lifelong visual imagery vividness extremes. Cortex 130 (2020): 426-440.
17. Milton F, Fulford J, Dance C, et al. Behavioral and Neural Signatures of Visual Imagery Vividness Extremes: Aphantasia versus Hyperphantasia. Cerebral Cortex Communications 2 (2021): tgab035.
18. Dance C J, Hole G, and Simner J. The role of visual imagery in face recognition and the construction of facial composites. Evidence from Aphantasia. Cortex; a journal devoted to the study of the nervous system and behavior, 167 (2023): 318-334.
19. Liu J, and Bartolomeo P. Probing the unimaginable: The impact of aphantasia on distinct domains of visual mental imagery and visual perception. Cortex 166 (2023): 338-347.
20. Zeman A, Dewar M, and Della Sala S. Lives without imagery – Congenital aphantasia. Cortex 73 (2015): 378-380.
21. Dawes A J, Keogh R, Andrillon T, et al. A cognitive profile of multi-sensory imagery, memory and dreaming in aphantasia. Scientific Reports 10 (2020): 10022.
22. Dupont W, Papaxanthis C, Lebon F, et al. Mental Simulations and Action Language Are Impaired in Individuals with Aphantasia. Journal of cognitive neuroscience (2023): 1-10.
23. Takahashi J, Saito G, Omura K, et al. Diversity of aphantasia revealed by multiple assessments of visual imagery, multisensory imagery, and cognitive style. Frontiers in Psychology 14 (2023): 1174873.
24. Dance C J, Ipser A, and Simner J. The prevalence of aphantasia (imagery weakness) in the general population. Consciousness and Cognition 97 (2022): 103243.
25. Blomkvist A, and Marks D F. Defining and "diagnosing" aphantasia: Condition or individual difference? Cortex; a Journal Devoted to the Study of the Nervous System and Behavior 169 (2023): 220-234.
26. Gulyás E, Gombos F, Sütöri S, et al. Visual imagery vividness declines across the lifespan. Cortex 154 (2022): 365-374.
27. Isaac A R, and Marks D F. Individual differences in mental imagery experience: Developmental changes and specialization. British Journal of Psychology 85 (1994): 479-500.
28. Campos A. Gender differences in imagery. Personality and Individual Differences 59 (2014): 107-111.
29. Muñiz J, Elosua P, Hambleton R K, et al. [International Test Commission Guidelines for test translation and

Zhang Z, et al., J Psychiatry Psychiatric Disord 2025
DOI:10.26502/jppd.2572-519X0246

adaptation: Second edition]. Psicothema 25 (2013): 151-157.

30. Cicchetti D V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychological Assessment 6 (1994): 284-290.

31. Rademaker R L, and Pearson J. Training Visual Imagery: Improvements of Metacognition, but not Imagery Strength. Frontiers in Psychology 3 (2012): 224.

32. van der Plas E, Zhang S, Dong K, et al. Identifying cultural differences in metacognition. Journal of Experimental Psychology: General 151 (2022): 3268-3280.

33. An L, Ma L, Xu N, et al. Life satisfaction, depressive symptoms, and blood pressure in the middle-aged and older Chinese population. Journal of psychosomatic research 170 (2023): 111367.

34. Pearson J. New Directions in Mental-Imagery Research: The Binocular-Rivalry Technique and Decoding fMRI Patterns. Curr. Dir. Psychol. Sci 23 (2014): 178-183.

35. Massoni S. Emotion as a boost to metacognition: How worry enhances the quality of confidence. Consciousness and Cognition 29 (2014): 189-198.



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