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Validation of the French version of Object Spatial Imagery and Verbal Questionnaire.

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Validation of the French version of the Object Spatial Imagery and Verbal Questionnaire.

Abstract

Introduction: The Object Spatial Imagery and Verbal Questionnaire (OSIVQ) measures individual differences in Visual-Verbal cognitive style and distinguishes between spatial and object visual imagery.

Objective: The aim of this study was to evaluate the psychometric properties of a French version of the OSIVQ.

Method: Seven hundred fifty-two participants completed the French OSIVQ and 144 of them also completed a paper-and-pencil assessment to evaluate spatial imagery, object imagery and verbal abilities.

Results: Principal component analyses of the OSIVQ showed good internal construct validity. Results also revealed pronounced individual differences and a significant gender effect. Confirmatory factorial analyses gave support to a three-dimensional model of cognitive style. Furthermore, correlations were observed across the different dimensions of the questionnaire and specific paper-and-pencil tasks.

Conclusion: Our results highlight the good psychometric properties of the French version of the OSIVQ.

Keywords: cognitive style, object imagery, spatial imagery, psychometric proprieties, French validation

Validation de la version française du Questionnaire d'Imagerie Spatiale-Objet et Verbal

Résumé

Introduction : Le questionnaire d'imagerie objet spatiale et verbal (OSIVQ) mesure les différences individuelles dans le style cognitif Visuel-Verbal et fait la distinction entre l'imagerie visuelle spatiale et l'imagerie visuelle objet.

Objectif : Le but de cette étude est d'évaluer les propriétés psychométriques d'une version française de l'OSIVQ.

Méthode : Sept cents cinquante-deux participants ont complété l'OSIVQ français et 144 d'entre eux ont également passé des tests papier-crayons pour évaluer l'imagerie spatiale, l'imagerie objet et les capacités verbales.

Résultats : Les analyses en composantes principales de l'OSIVQ ont démontré une bonne construction interne. Les résultats ont également révélé d'importantes différences individuelles et un effet significatif du genre. Les analyses factorielles confirmatoires sont en accord avec un modèle tridimensionnel du style cognitif. De plus, des corrélations ont été observées entre les différentes dimensions du questionnaire et les tâches papier-crayons spécifiques.

Conclusion : Nos résultats permettent de valider une version française de l'OSIVQ.

Mots clés : style cognitif, imagerie objet, imagerie spatiale, propriétés psychométriques, validation française

Cognitive styles refer to psychological dimensions representing consistencies in an individual's manner of cognitive functioning, particularly with respect to acquiring and processing information (Messick, 1976). Many forms of cognitive styles have been described but the one most frequently used is the visual-verbal style (Kozhevnikov, 2007). The visual-verbal style is based on the dual-coding theory according to which information is processed and mentally represented in two ways: verbally and visually (Paivio, 1991). The Visual-Verbal cognitive style therefore describes consistencies and preferences in processing visual versus verbal information. Mayer and Massa (2003) further define the "visualizer-verbalizer cognitive style" as thinking in pictures or words. These preferences reflect "heuristics and individual uses to process information about his or her environment" (Kozhevnikov, 2007).

Visual representation (or visual mental imagery) has long been considered to be of a unitary nature, but Koshevnikov and her team have provided evidence for two distinct types of visual mental imagery: object and spatial imagery (Kozhevnikov et al., 2002; Kozhevnikov et al., 2007). Object imagery allows pictorial and analogous representations of objects and scenes, whereas spatial imagery is more a schematic representation of objects and patterns with their spatial relationships. This conception is supported by brain research showing the existence of two distinct neuronal pathways for the processing of different aspects of visual information (Farah et al., 1988; Kosslyn, 2005; Kosslyn et al., 2006). The ventral pathway is dedicated to processing the visual appearance of objects and scenes in terms of their shape, color and texture. The dorsal pathway processes object location, movement, spatial relationships and transformations (Kosslyn et al., 2001; Mazard et al., 2004). Furthermore, visuo–spatial abilities are associated with a more efficient use of the dorsal pathway (Mayer & Massa, 2003; Lamm et al., 1999) whereas visuo–object abilities are associated with a more efficient use of the ventral pathway (Motes et al., 2008). In this context, object versus spatial cognitive

styles refer to an individual's preferences or habits of processing information in terms of object and spatial visual mental imagery.

Numerous self-reported questionnaires have been created to assess cognitive style, the most famous one being the Verbalizer-Visualizer Questionnaire (VVQ; Richardson, 1977). However, the VVQ has been criticized for poor internal reliability (Boswell & Pickett, 1991). Moreover, the visual subscale of this questionnaire did not correlate with visual-spatial aptitude measures, which suggests a lack of predictive validity of the VVQ (Mayer & Massa, 2003). This lack of predictive validity is also observed in other cognitive style questionnaires as noted in Kozhevnikov's review on cognitive style (Kozhevnikov, 2007). As pre-existing questionnaires presented certain flaws and none of them evaluated the two dimensions of visual mental imagery, Blajenkova and Kozhevnikov developed the Object Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009). The OSIVQ thus evaluates three dimensions of cognitive style: object imagery, spatial imagery and verbal.

Blajenkova and Kozhevnikov (2009) evaluated the psychometric properties of the OSIVQ among 625 students. They found that the OSIVQ showed good internal construct validity (with a three-factor solution of a principal component analysis), good internal consistency (for the verbal scale, Cronbach alpha reached .74; for the object scale, $\alpha = .83$ and for the spatial scale, $\alpha = .79$) (Blazhenkova & Kozhevnikov, 2009). Furthermore, the OSIVQ demonstrated acceptable test-retest reliability with significant correlations between testing sessions ($r = .73$ for the verbal scale, $r = .75$ for the object scale and $r = .84$ for the spatial scale).

Moreover, unlike many previous questionnaires, OSIVQ scores significantly correlated with performances on different tasks, ensuring the convergent validity of the instrument. "Object visualizers" were found to have good performances in object imagery tasks that required vivid visualization of pictorial properties (e.g., recognizing degraded objects) whereas "spatial

visualizers" had good performances during spatial imagery tasks that involved visualization of schematic representations and spatial transformations (e.g., mental rotation) (Blajenkova et al., 2006; Kozhevnikov et al., 2005). Finally, OSIVQ scores predicted professional interests or course choices. Visual artists were generally "object visualizers" and had a high object imagery ability, while scientists and engineers were generally "spatial visualizers" and had a high spatial imagery ability (Blajenkova et al., 2006; Blazhenkova & Kozhevnikov, 2009; Blazhenkova & Kozhevnikov, 2010; Kozhevnikov et al., 2010). The OSIVQ is therefore an ecologically valid scale with good predictive validity and psychometric properties.

However, it is worth noting that Blazhenkova and Kozhevnikov (2009) reported a significant gender effect on the OSIVQ scores. Women obtained higher scores than men on the Object scale. In contrast, men obtained higher scores than women on the spatial scale. As for the Verbal scale, no gender differences were observed (Blajenkova et al., 2006; Blazhenkova & Kozhevnikov, 2009, 2010; Blazhenkova et al., 2011; Campos, 2014). Gender differences are frequently found in spatial mental imagery. For example, studies using the Mental Rotation Test (MRT; Vandenberg & Kuse, 1978) found significantly higher scores for men (Blajenkova et al., 2006; Blazhenkova & Kozhevnikov, 2010; Campos, 2014; Dean & Morris, 2003; Vandenberg & Kuse, 1978). Hegarty (2018) established that the use of an analytic strategy ("global-shape" strategy) in this test, contrary to the use of imagery transformation, was positively correlated with accuracy. The difference between men and women in the MRT might be due to a difference in the use of strategies and not in spatial imagery per se. To test this hypothesis, Campos and Lustres (2019) compared performance between men and women with tests measuring spatial imagery ability and mental rotation of images ability. Their results showed significant gender differences in image rotation (men obtained higher scores) but not in spatial imagery. Regarding the gender differences in the vividness of mental representations, the literature is more contradictory. In his review of the literature on the

Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973) Richardson (1995) concluded that women obtained higher scores than men while other authors found no gender differences with the VVIQ 2 (Campos, 2014; McKelvie, 1995). With another questionnaire on the vividness of mental images, Betts' Questionnaire Upon Mental Imagery (Betts' QMI; Sheehan, 1967), White, Ashton, and Brown (1977) found higher scores for women whereas other studies found no significant differences (Campos, 2014; Campos & Pérez-Fabello, 2005; Sacco & Reda, 1998).

To conclude, the OSIVQ evaluates the visual/verbal cognitive style allowing also to make the difference between object and spatial imagery and possesses robust psychometric properties. Therefore, we aimed to validate a French version of the OSIVQ to provide an equivalent tool to assess cognitive style in the French community. To do so, we formulated several hypotheses in order to evidence the same structure as the original version of the OSIVQ (Blazhenkova & Kozhevnikov, 2009) which is a three factors questionnaire that evaluates the three dimensions of cognitive style: object imagery, spatial imagery and verbal. First, the principal component analysis should reveal three distinct factors that will correspond to three dimensions of cognitive style. Second, confirmatory analysis should show that a three-factor model best fits the data. Finally, we should observe a positive correlation between participants' ratings on the object, spatial and verbal scales of the OSIVQ and the corresponding behavioral task.

Material and method

1. Participants

For the exploratory study, 450 participants (121 males and 329 females; age range 18 to 50, *Mean* = 31.51, *SD* = 8.90) completed the questionnaire. According to the formula N = Z*10 (with N = number of subjects and Z = number of items) a minimum of 450 subjects is

necessary for accurate validation of a questionnaire with 45 items (Hair et al., 1998).

For the confirmatory study, 302 participants, different from those in the exploratory study, (63 males and 239 females; age range 18 to 50, *Mean* = 27.84, *SD* = 8.85) were recruited. 144 of them also took a paper-and-pencil assessment to evaluate spatial imagery, object imagery and verbal abilities in addition to the questionnaire. This number of participants is slightly below the number required according to the formula (N = 34*10 = 340).

Participants were recruited by posting an advertisement on social media (Facebook ®) and among undergraduate students in the University community. Participants were invited to participate in a study which evaluates difference in cognitive style.

2. General procedure

The original English version of the Object Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009) was translated into French using a classical translation-back translation procedure: the original version of the questionnaire was first translated from English into French by a native English-speaking person who is fluent in French. This French version was then translated back into English by a native French-speaking English teacher. The two English versions were then compared in order to validate the French translation. The translated version of the questionnaire is presented in supplementary material.

For the exploratory study, participants responded to our French version of the Object Spatial Imagery and Verbal Questionnaire (OSIVQ) online. The online questionnaire was created using *LimeSurvey*©, and securely hosted by the University of Toulouse.

For the confirmatory study, participants were administered the French version of the OSIVQ and the following paper-and-pencil assessments: one spatial imagery test (Mental Rotation Test; Vandenberg & Kuse, 1978), one object imagery assessment (Vividness of Visual Imagery Questionnaire; Marks, 1973) and one verbal test (Mill Hill vocabulary test; Raven et al., 2003) described below. Each participant was given an anonymous code. This specific code was used for the online questionnaire and the paper – pencil tasks. The order of tests was randomized.

All participants read an information sheet with explanations concerning the study and indicated their consent before beginning.

This study was approved by the Research Ethics Committee of Toulouse University and received authorization from the French National Commission for Informatics and Freedoms (CNIL) regarding the protection and anonymization of personal data.

3. Measures

Object Spatial Imagery and Verbal Questionnaire (OSIVQ; Blazhenkova & Kozhevnikov, 2009) French translation: OSIVQ is a 45-item self-report questionnaire designed to assess separately an individual's propensities for three different cognitive style dimensions (object imagery, spatial processing and verbal processing). The following instructions were provided to the participants: "*This is a questionnaire about the way you think. Please read the following statements and rate each of them on a 5-point scale. Select 5 to indicate that you absolutely agree that the statement describes you, and select 1 to indicate that you totally disagree with the statement. Select 3 if you are not sure, but try to make a choice. It is very important that you answer all the items in the questionnaire*". There was no time limit for the completion of the questionnaire and participants could go back to correct their answers if they wanted.

Mental Rotation Test (MRT; Vandenberg & Kuse, 1978 French adaptation by Albaret & Aubert, 1990): MRT measures mental rotation ability. Participants compared drawings of three-dimensional geometric figures with cubes. Each item consisted of a target figure and four comparison figures. Two of the comparison figures were rotated versions of the target figure, and the other two comparison figures were rotated mirror images of the target figure. Participants were to indicate which two of the four figures were similar to the target figure. The test includes two parts with 10 items each and participants have 3 minutes to complete each part of the test. 2 points were awarded for each item with 2 correct answers, 1 point if only one of the drawings was chosen and it was correct, 0 points if at least one of the two choices was incorrect.

Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973 French translation by Santarpia et al., 2008): The VVIQ is a frequently used self-report measure of the vividness of visual mental images. Participants had to rate the vividness of mental images they were asked to create (e.g. "*The sun is rising above the horizon into a hazy sky and a strong wind blows on the trees and on the lake, causing waves*"). Participants responded on a 5-point scale (from "no picture at all" to "a perfectly clear and vivid picture"). There are 16 items and each item is scored from 1 to 5 and the total score (sum of the scores of all items) gives an indication of the vividness of mental images.

Mill Hill vocabulary test (Raven et al., 2003 French adaptation by Deltour, 1993): This test assesses vocabulary knowledge and verbal skills. In this paper and pencil test, participants have to choose and circle the word that has either the same meaning or nearly the same meaning (synonym) as the target word, among six others in a printed list. There are 34 items.

4. Data analysis

One spatial and three verbal items of the OSIVQ were negatively formulated and therefore reversed for the analysis. The internal consistency was measured with Cronbach alphas for each subscale of the OSIVQ. McKelvie (1994) recommended alpha coefficients of .85 in order to accept the validity of scales, and the minimum acceptable coefficient should not be less than .70 (Nunnally, 1978). Exploratory analyses were conducted using principal component factor analysis with Varimax rotation using IBM *SPSS* (Version 23.0).

For descriptive statistics and in order to evaluate a possible gender effect, Student's t-test and repeated measures ANOVAs were performed.

In order to assess the psychometric properties of the OSIVQ and its factorial validity, confirmatory factor analysis (CFA) and path analysis were used and computed using IBM AMOS (Version 22).

We compared the two models: a two-factor model, as in the traditional model, and a three-factor model, as in Blazhenkova and Kozhevnikov's model (2009), with a second order CFA analysis. We compared the different models by using fit indices: chi-square test (χ^2/df), root mean square error of approximation (RMSEA), Bentler's comparative fit index (CFI), goodness of fit index (GFI) and Akaike information criterion (AIC). It was assumed that the model could be considered satisfactory when the χ^2/df was lower than 3, RMSEA lower than .10, CFI higher than .80 and GFI higher than .90 (Tabachnick & Fidell, 2001). The AIC is a comparative measure of fit and so it is meaningful when two different models are estimated: the lower the value is, the better the fit (Tabachnick & Fidell, 2007).

Convergent validity of the OSIVQ was measured with correlations between the OSIVQ subscale scores and the paper-and-pencil assessment scores. A correlation with $.30 < r < .50$ is considered as low, moderate with $.50 < r < .70$ and strong with $r > .70$ (Tabachnick & Fidell,

2001).

Results

1. Exploratory study

1.1. Principal component analysis

In their principal components analysis, Blazhenkova and Kozhevnikov (2009) found 18 factors with eigenvalues above 1.0. Only three factors had eigenvalues greater than the others and explained a total of 31.95% of the variance. Their second three-factor principal components analysis confirmed that the first factor (12.8% of variance) was loaded only by object imagery items, the second factor (12.3% of variance) only by spatial imagery items, and the third (6.8% of variance) was loaded only by verbal items. Thus, we expected that, as for the original OSIVQ, findings would support three distinct factors corresponding to the three dimensions of cognitive style: object imagery, spatial imagery and verbal.

Our initial principal component analysis revealed an 11-factor solution with eigenvalues above 1. Only three of them had eigenvalues distinctly higher (6.23, 5.73 and 3.29) than the others (ranging from 2.05 to 1.02). These first three factors explained 33.88% of the variance in total (13.84%, 12.73% and 7.31%). None of the other factors met the recommendations for component saturation (Guadagnoli & Velicer, 1988) and the analysis of the decreasing eigenvalue curve ("scree plot") also revealed a three-factor solution. Therefore, other solutions were not considered further.

Based on these results, a second principal component analysis with Varimax rotation was performed with 3 factors. First of all, the test conditions of use were checked using the Bartlett test. The sphericity test was significant ($\chi^2(990) = 7321.69$, $p < .001$), and the Kaiser-Meyer-Olkin test (KMO) was greater than 0.80 (KMO = 0.839), indicating sufficient correlations for component analysis. Items that loaded significantly on multiple factors were

removed from the analysis. Two items were considered to "cross-load" if the difference between two factors was less than .20 (Tabachnick & Fidell, 2001). Items that did not load significantly (below the critical value of .35) and therefore did not correlate with any factor were also eliminated (Hair et al., 1998). Thus, 11 items (3, 10, 15, 19, 21, 22, 24, 25, 28, 36 and 38) were removed from the original questionnaire in order to obtain a coherent structure. The 34 remaining items of the OSIVQ (14 items for the object scale, 11 items for the spatial scale and 9 items for the verbal scale) and their loadings on the 3 factors are presented in Table 1.

INSERT TABLE 1 HERE

The first factor was identified as the object imagery factor, since all of the items designed to assess object imagery loaded positively on this factor, whereas all of the items designed to assess spatial imagery or verbal preferences did not load. The second factor was identified as the spatial imagery factor, since all of the items designed to assess spatial imagery loaded positively on the second factor, whereas none of other items did. Finally, the third factor was identified as the verbal factor, since all of the items designed to assess verbal preferences loaded positively on the third factor and other items did not load on this factor. [1]

1.2. Internal consistency

The internal consistency was measured with Cronbach's alpha. For the verbal scale, $\alpha = .76$; for the object scale, $\alpha = .84$ and for the spatial scale, $\alpha = .85$. Cronbach alphas showed a good internal consistency for the three sub-scales, with the selected items.

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[1]*As there is a gender imbalance in our participants, an exploratory principal component analysis was also performed with a smaller group containing the same number of women and men. With this group, the same results were obtained. As no difference was found and in order to have a satisfactory statistical power, analyses were conducted on all participants.*

In the original version of Blazhenkova and Kozhevnikov (2009) Cronbach alphas reached .74 for the verbal scale; α = .83 for the object scale and α = .79 for the spatial scale.

1.3. Descriptive statistics and gender differences

As a result of the selection of the 34 items, the number of items per subscale is not equivalent. Thus, for each participant, the scores for each subscale were transformed into percentages.

For the three subscales, the mean Spatial score was 60.65 (± 17.09); the mean Object score was 72.10 (± 14.39) and the mean Verbal score was 66.64 (± 15.48).

We then examined the effect of gender on object-spatial-verbal preferences for information processing, using a repeated measures ANOVA. Our results demonstrated a significant difference between the three scales of the OSIVQ, $F(2, 896) = 21.375$, $p < .001$, $\eta^2 = .046$. Participants were inclined to rate themselves higher on Object imagery than on Spatial imagery ($p < .001$) or Verbal dimensions ($p < .001$) but there was no difference between Spatial imagery scores and Verbal scores ($p = .092$).

The repeated measures ANOVA showed no effect of gender, $F(1, 448) = 3.396$, $p = .066$, $\eta^2 = .008$, but a significant Gender*OSIVQ interaction, $F(2, 896) = 34.968$, $p < .001$, $\eta^2 = .072$. Male participants scored higher than female participants on the OSIVQ spatial subscale [*Mean male participants* = 69.80, *SD* = 13.80, *Mean female participants* = 57.29, *SD* = 16.96, t(448) = 7.27, $p < .001$]. Female participants had higher OSIVQ object imagery scores than male participants [*Mean female participants* = 73.56, *SD* = 14.22, *Mean male participants* = 68.16, *SD* = 14.15, t(448) = -3.58, $p < .001$] . We found no significant gender difference on OSIVQ verbal scores, t(448) = -1.06, $p = .288$.

2. Confirmatory study

2.1. Confirmatory factor analysis

According to the traditional model of Visual–Verbal style, Verbal and Visual styles constitute two opposite dimensions whereas Blazhenkova and Kozhevnikov's theoretical approach distinguishes two types of imagery (object and spatial). According to Blazhenkova and Kozhevnikov's revised model of cognitive style, there should be three separate dimensions (object, spatial and verbal). In their original version of the questionnaire, Blazhenkova and Kozhevnikov indeed found that a three-factor model was the one that best fitted the data. Following our exploratory analysis, some items were eliminated. As the structure of the questionnaire was modified, we decided, to also test a three-factor model and a two-factor model in our confirmatory factor analysis.

Figure 1 shows the results of the estimated three-factor model, and the values of fit for the different models are reported in Table 2.

INSERT FIGURE 1 HERE

As shown in Figure 1, items from the verbal scale scores loaded on a "verbal" factor, items from the spatial imagery scale scores loaded on a "spatial" factor and items from the object imagery scale scores loaded on an "object" factor. Interestingly, results of the confirmatory factor analysis indicated no significant correlation between our three factors (r = -.16 between spatial and verbal factors; r = .08 between spatial and object factors and r = .19 between object and verbal factors) (see Figure 1).

INSERT TABLE 2 HERE

In order to confirm our item selection, we tested the fit of the three-factor model with all 45 original items of our translation. The values showed that the fit of our 34 selected items scale was better than the one with the 45 original items (see Table 2).

Secondly, we compared the three-factor and the two-factor models using our 34 selected items. The two-factor model showed poor fit indices and the AIC score was lower than with the three-factor model. Overall, indices suggested that the three-factor model fits the data well which indicates that this model does explain the data. This is why the three-factor solution was retained.

2.2. Convergent validity

Our hypotheses were in line with those of Blazhenkova and Kozhevnikov (2009) in the original version of the OSIVQ. We expected positive correlations between the object scale scores of the OSIVQ and the VVIQ scores (as the VVIQ measures the vividness of mental imagery), the spatial scale scores and the MRT scores (as the MRT requires spatial manipulations), and the verbal scale scores and the Mill Hill scores (as the Mill Hill is a verbal measure).

Correlations among the measures of verbal, spatial and object ability are presented in Table 3. Higher OSIVQ verbal scores were associated with higher scores on the Mill Hill measure of verbal capacity ($p < .001$). Higher OSIVQ spatial scores were associated with higher scores on the MRT measure of spatial imagery ($p < .001$). Finally, higher OSIVQ object imagery scores were associated with higher scores on the VVIQ measure of object imagery ($p < .001$). Thus, all three scales of the OSIVQ demonstrated acceptable convergent validity.

Regarding the discriminant validity of the three scales, although none of the OSIVQ scales correlated positively with any task corresponding to the other scales, there was a significant but weak negative correlation between the OSIVQ verbal scores and the MRT scores ($r = -.29$, $p = .001$).

INSERT TABLE 3 HERE

Discussion

We developed a French version of the Object Spatial Imagery and Verbal Questionnaire (OSIVQ), a self-report instrument that allows the evaluation of the visual-verbal cognitive style in three dimensions with two imagery (object and spatial) scales and one verbal scale. The first important outcome of the exploratory study is that, as hypothesized, our translated version of the OSIVQ (with the 34 selected items) demonstrated acceptable internal consistency for all three scales. Furthermore, our principal component analysis also revealed three distinct factors (object, spatial and verbal). These results are thus consistent with Blazhenkova and Kozhevnikov's model of cognitive style (Blazhenkova & Kozhevnikov, 2009).

The confirmatory study provided further validation of our French version of the OSIVQ. The traditional two-factor model that describes Visual–Verbal cognitive style as a bipolar dimension was compared to the three-factor model that comprises three independent dimensions (verbal, object and spatial). The results of our confirmatory factor analysis indicate that the overall fit of the three-factor model was indeed significantly greater than that of the two-factor model. It should be noted that the number of participants in the confirmatory study is a little below the recommended minimal number needed, which might explain why the fit of our three-factor model is satisfactory but could be improved if a larger sample was tested. Overall, these findings again provide support for the Blazhenkova and Kozhevnikov three-dimensional model of cognitive style.

Lastly, in order to validate our translation, our data showed acceptable convergent validity. Indeed, participants' ratings on the object, spatial and verbal scales correlated positively with the corresponding task only. Although we did not find significant correlations between the verbal and spatial factors nor between OSIVQ verbal and spatial scores, we did find a weak

but significant negative correlation between the OSIVQ verbal scores and MRT scores. This suggests that there might be some interference between spatial and verbal information processing. It is worth noting that a negative correlation between verbal and spatial factors was similarly found by Blazhenkova and Kozhevnikov (2009). They also found negative correlations between OSIVQ object and spatial imagery measures which we did not find. Rather, our results indicate that object and spatial imagery are independent. The difference might be due to the number of items used in the two studies.

Another important finding is that the distribution of object, spatial and verbal scores differs among the three subscales. Participants tend to rate themselves higher on the object imagery scale than on other scales. This trend is consistent with previous findings (Blazhenkova & Kozhevnikov, 2009; Chabris et al., 2006). In addition, we also reported a significant gender effect, with females tending to report themselves as object visualizers and males as spatial visualizers. This difference is not surprising as previous studies reported a gender difference on spatial tasks with males performing better than females (Linn & Petersen, 1985) and higher spatial imagery ratings for males, while females tend to report higher object imagery and imagery vividness (Blajenkova et al., 2006). According to Blajenkova et al., the difference between spatial and object visualizers, however, cannot be reduced to gender differences (Blajenkova et al., 2006; Kozhevnikov et al., 2005). In fact, 40.42% of our female participants reported above average spatial imagery preferences and 38.02% of male participants reported above average object imagery preferences. Furthermore, using partial correlations, Blazhenkova and Kozhevnikov found that all the significant correlations between different object, spatial and verbal scales and corresponding objective measures remained significant even after the effect of gender was partialled out (Blazhenkova & Kozhevnikov, 2009).

One limitation of our study is that we were not able to evaluate the test-retest reliability and the ecological validity of this translated questionnaire. It would be interesting in the future to

reevaluate some of our participants. Similarly, we were unable to assess cognitive style in different professional domains or university courses as did Blazhenkova and Kozhevnikov (2009). Nevertheless, our translated questionnaire showed good psychometric properties. We believe that it was necessary to translate this questionnaire in order to provide a French tool that evaluates cognitive style while making the distinction between object and spatial imagery since cognitive styles have important every-day life implications that need to be understood.

In fact, the original version of the OSIVQ has allowed many psychology and cognition studies to be conducted that showed the importance of cognitive style. For instance, when learning with texts and pictures, the learner's cognitive style might have a direct influence on learning behavior and preferences. Indeed, when learning with text–picture combinations, participants scoring high on the object scale and/or the spatial scale of the OSIVQ relied more heavily on pictures than on texts, while participants scoring high on the verbal scale tended to rely more on text (Höffler et al., 2017). Moreover, cognitive style also seems be linked with mathematical performances. “Spatial visualizers” had significantly higher spatial ability and performed better in mathematical tests than “object visualizers” (Haciomeroglu, 2016). Finally, cognitive style has been shown to influence spatial orientation. “Object visualizers” were better than “spatial visualizers” at recognizing visual clues in an orientation task whereas “spatial visualizers” were better than “object visualizers” at judging relative positions between the visual clues (Kraemer et al., 2017). A link between cognitive style and creativity was also established. Object visualization seems to be linked to artistic creativity (physical creativity), spatial visualization is linked to scientific creativity (creativity in math and science), while both are distinct from verbal creativity (creativity in interpersonal relationships, communication, and writing) (Kozhevnikov et al., 2013).

In conclusion, our French translation of the OSIVQ presents good psychometric properties and is in agreement with the latest theories on cognitive style. Furthermore, this French version of the OSIVQ can certainly be a valuable tool for future psychological research.

Conflict of interest

The authors have no conflict of interest to declare.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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References

Albaret, J. M., & Aubert, E. (1996). Etalonnage 15-19 ans du test de rotation mentale de Vandenberg. *Evolutions psychomotrices*, 206-209.

Blajenkova, O., Kozhevnikov, M., & Motes, M. A. (2006). Object-spatial imagery: A new self-report imagery questionnaire. *Applied Cognitive Psychology*, *20*(2), 239–263. https://doi.org/10.1002/acp.1182

Blazhenkova, O., Becker, M., & Kozhevnikov, M. (2011). Object-spatial imagery and verbal cognitive styles in children and adolescents: Developmental trajectories in relation to ability. Learning and Individual Differences, 21, 181–287

Blazhenkova, O., & Kozhevnikov, M. (2009). The new object-spatial-verbal cognitive style model: Theory and measurement. *Applied Cognitive Psychology*, *23*(5), 638–663. https://doi.org/10.1002/acp.1473

Blazhenkova, O., & Kozhevnikov, M. (2010). Visual-object ability: A new dimension of non-verbal intelligence. *Cognition*, *117*(3), 276-301

Boswell, D. L., & Pickett, J. A. (1991). A study of the internal consistency and factor structure of the Verbalizer-Visualizer Questionnaire. *Journal of Mental Imagery*, *15*(3-4), 33–36.

Campos, A. (2014). Gender differences in imagery. *Personality and Individual Differences*, *59*, 107-11.

Campos, A., & Lustres, A. (2019). Gender and age differences in spatial imagery and image rotation. *Imagination, Cognition and Personality*, *39*(1), 109-119.

Campos, A., & Pérez-Fabello, M. J. (2005). The Spanish version of the Betts' questionnaire upon mental imagery. *Psychological Reports*, 96, 51–56.

Chabris, C. F., Jerde, T. E., Woolley, A. W., Gerbasi, M. E., Schuldt, J. P., Bennett, S. L., ... & Kosslyn, S. M. (2006). Spatial and object visualization cognitive styles: Validation studies in 3800 individuals. *Group brain technical report*, *2*, 1-20.

Dean, G. M., & Morris, P. E. (2003). The relationship between self-reports of imagery and spatial ability. British Journal of Psychology, 94, 245–273.

Deltour, J. J. (1993). Echelle de vocabulaire de Mill Hill de JC Raven. *Adaptation française et normes européennes du Mill Hill et du Standard Progressive Matrices de Raven (PM38). Braine-le-Château: Editions l'application des techniques modernes.*

Farah, M. J., Hammond, K. M., Levine, D. N., & Calvanio, R. (1988). Visual and spatial mental imagery: Dissociable systems of representation. *Cognitive Psychology*, *20*(4), 439–462. https://doi.org/10.1016/0010-0285(88)90012-6.

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological bulletin*, *103*(2), 265.

Haciomeroglu, E. S. (2016). Object-spatial Visualization and Verbal Cognitive Styles, and Their Relation to Cognitive Abilities and Mathematical Performance. *Educational Sciences: Theory & Practice*, *16*(3), 978–1003. https://doi.org/10.12738/estp.2016.3.0429

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data analysis* (Vol. 5, No. 3, pp. 207-219). Upper Saddle River, NJ: Prentice hall.

Hegarty, M. (2018). Ability and sex differences in spatial thinking: What does the mental rotation test really measure?. *Psychonomic bulletin & review*, *25*(3), 1212-1219

Höffler, T. N., Koć-Januchta, M., & Leutner, D. (2017). More Evidence for Three Types of Cognitive Style: Validating the Object-Spatial Imagery and Verbal Questionnaire Using Eye Tracking when Learning with Texts and Pictures: Evidence for three types of cognitive style. *Applied Cognitive Psychology*, *31*(1), 109–115. https://doi.org/10.1002/acp.3300

IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

Kosslyn, S. M. (2005). Mental images and the Brain. *Cognitive Neuropsychology*, *22*(3–4), 333–347. https://doi.org/10.1080/02643290442000130

Kosslyn, S. M., Ganis, G., & Thompson, W. L. (2001). Neural foundations of imagery. *Nature Reviews Neuroscience*, *2*(9), 635–642. https://doi.org/10.1038/35090055

Kosslyn, S. M., Thompson,W. L., & Ganis, G. (2006). *The case for mental imagery*. New York, NY: Oxford University Press.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin*, *133*(3), 464–481. https://doi.org/10.1037/0033-2909.133.3.464

Kozhevnikov, M. Blazhenkova 0, Becker M (2010) Trade-off in object versus spatial visualization abilities: restriction in the development of visual-processing resources. *Psychon Bull Rev*, 17129-35.

Kozhevnikov, M., Hegarty, M., & Mayer, R. E. (2002). Revising the Visualizer-Verbalizer Dimension: Evidence for Two Types of Visualizers. *Cognition and Instruction*, *20*(1), 47–77. https://doi.org/10.1207/S1532690XCI2001_3

Kozhevnikov, M., Kosslyn, S., & Shephard, J. (2005). Spatial versus object visualizers: A new characterization of visual cognitive style. *Memory & Cognition*, *33*(4), 710–726. https://doi.org/10.3758/BF03195337

Kozhevnikov, M., Kozhevnikov, M., Yu, C. J., & Blazhenkova, O. (2013). Creativity, visualization abilities, and visual cognitive style. *British Journal of Educational Psychology*, *83*(2), 196–209. https://doi.org/10.1111/bjep.12013

Kozhevnikov, M., Motes, M. A., & Hegarty, M. (2007). Spatial visualization in physics problem solving. *Cognitive science*, *31*(4), 549-579.

Kraemer, D. J. M., Schinazi, V. R., Cawkwell, P. B., Tekriwal, A., Epstein, R. A., & Thompson-Schill, S. L. (2017). Verbalizing, visualizing, and navigating: The effect of strategies on encoding a large-scale virtual environment. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *43*(4), 611–621. https://doi.org/10.1037/xlm0000314

Lamm, C., Bauer, H., Vitouch, O., & Gstättner, R. (1999). Differences in the ability to process a visuo-spatial task are reflected in event-related slow cortical potentials of human subjects. *Neuroscience Letters*, *269*(3), 137-140

Linn, M. C., & Petersen, A. C. (1985). Emergence and characterization of sex differences in spatial ability: A meta-analysis. *Child development*, 1479-1498.

Marks, D. F. (1973). Visual imagery differences in the recall of pictures. *British Journal of Psychology*, *64*(1), 17-24.

Mayer, R. E., & Massa, L. J. (2003). Three Facets of Visual and Verbal Learners: Cognitive Ability, Cognitive Style, and Learning Preference. *Journal of Educational Psychology*, *95*(4), 833–846. https://doi.org/10.1037/0022-0663.95.4.833

Mazard, A., Tzourio- Mazoyer, N., Crivello, F., Mazoyer, B., & Mellet, E. (2004). A PET meta- analysis of object and spatial mental imagery. *European Journal of Cognitive Psychology*, *16*(5), 673–695. https://doi.org/10.1080/09541440340000484

McKelvie, S. J. (1994). Guidelines for judging psychometric properties of imagery questionnaires as research instruments: A quantitative proposal. *Perceptual and Motor Skills*, 79, 1219–1231.

McKelvie, S. J. (1995). 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, 1–106

Messick, S. (1976). Personality consistencies in cognition and creativity. *Individuality in learning*, *4*, 22. Oxford, England: Jossey-Bass.

Motes, M. A., Malach, R., & Kozhevnikov, M. (2008). Object-processing neural efficiency differentiates object from spatial visualizers. *Neuroreport*, *19*(17), 1727-173

Nunnally, J. C. (1978). Psychometric theory (2nd edit.) mcgraw-hill. *Hillsdale, NJ*, *416*.

Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *45*(3), 255

Raven, J., Raven, J. C., & Court, J. H. (2003). Manual for Raven's Progressive Matrices and Vocabulary Scales. San Antonio, TX: Harcourt Assessment.

Raven, J., JH Court, & Raven, J. C. (1998). *Manual for Raven's progressive matrices and vocabulary scales*.

Richardson, A. (1977). Verbalizer-visualizer: A cognitive style dimension. *Journal of Mental Imagery*, 1, 109-125

Richardson, J. T. E. (1995). Gender differences in the vividness of visual imagery questionnaire: A meta-analysis. *Journal of Mental Imagery*, 19, 177–187.

Sacco, G., & Reda, M. (1998). The Italian form of the questionnaire upon mental imagery (QMI). *Journal of Mental Imagery*, 22, 213–226.

Santarpia, A., Blanchet, A., Poinsot, R., Lambert, J. F., Mininni, G., & Thizon-Vidal, S. (2008). Évaluer la vivacité des images mentales dans différentes populations françaises. *Pratiques psychologiques*, *14*(3), 421-441

Sheehan, P. W. (1967). A shortened form of Betts' questionnaire upon mental imagery. *Journal of Clinical Psychology*, 23, 386–389.

Tabachnick, B. G., & Fidell, L. S. (2001). Principal components and factor analysis. *Using multivariate statistics*, *4*(1), 582-633.

Tabachnick, B. G., & Fidell, L. S. (2007). Using multivariate statistics Boston. *MA: Allyn and Bacon*, *5*, 2007.

Vandenberg, S. G., & Kuse, A. R. (1978). Mental rotations, a group test of three-dimensional spatial visualization. *Perceptual and Motor Skills, 47*(2), 599-604.

White, K. D., Ashton, R., & Brown, M. D. (1977). The measurement of imagery vividness: Normative data and their relationship to sex, age, and modality differences. *British Journal of Psychology*, 68, 203–211.

Table 1. Principal component loadings, after Varimax rotation, for the translated OSIVQ items.

	OSIVQ items	Factor 1 Object	Factor 2 Spatial	Factor 3 Verbal
20	My images are very vivid and photographic	.75		
29	I can easily remember a great deal of visual details that someone else might never notice. For example, I would just automatically take some things in, like what color is a shirt someone wears or what color are his/her shoes	.69		
40	I remember everything visually. I can recount what people wore to a dinner and I can talk about the way they sat and the way they looked probably in more detail than I could discuss what they said	.69		
34	I can close my eyes and easily picture a scene that I have experienced	.69		
33	Sometimes my images are so vivid and persistent that it is difficult to ignore them	.62		
6	My images are very colorful and bright	.62		
13	I have a photographic memory	.62		
43	My visual images are in my head all the time. They are just right there	.61		
26	When I imagine the face of a friend, I have a perfectly clear and bright image	.57		
11	When reading fiction, I usually form a clear and detailed mental picture of a scene or room that has been described	.53		
45	When I hear a radio announcer or a DJ I've never actually seen, I usually find myself picturing what he or she might look like	.47		
23	My mental images of different objects very much resemble the size, shape and color of actual objects that I have seen	.40		
18	When entering a familiar store to get a specific item, I can easily picture the exact location of the target item, the shelf it stands on, how it is arranged and the surrounding articles	.39		
12	If I were asked to choose among engineering professions, or visual arts, I would choose visual arts	.35		
1	I was very good in 3D geometry as a student		.79	
14	I can easily imagine and mentally rotate three-dimensional geometric figures		.76	
31	In school, I had no problems with geometry		.74	
32	I am good in playing spatial games involving constructing from blocks and paper (e.g. Lego, Tetris, Origami)		.71	
44	My graphic abilities would make a career in architecture relatively easy for me		.68	
27	I have excellent abilities in technical graphics		.68	
42	I find it difficult to imagine how a three-dimensional geometric figure would exactly look like when rotated		.66	
30	I can easily sketch a blueprint for a building I am familiar with		.65	
7	I prefer schematic diagrams and sketches when reading a textbook instead of colorful and pictorial illustrations		.45	
17	When thinking about an abstract concept (or building), I imagine an abstract schematic building in my mind or its blueprint rather than a specific concrete building		.40	
5	Architecture interests me more than painting		.36	
16	My verbal skills are excellent			.79
35	I have better than average fluency in using words			.76
4	My verbal abilities would make a career in language arts relatively easy for me			.64
39	I enjoy being able to rephrase my thoughts in many ways for variety's sake in both writing and speaking			.62
37	I am always aware of sentence structure			.58
9	Essay writing is difficult for me and I do not enjoy doing it at all			.52
2	I have difficulty expressing myself in writing			.52
41	I sometimes have a problem expressing exactly what I want to say			.48
8	I tell jokes and stories better than most people			.38

Table 2. Values of fit for the different models

Model	X^2	df	*p*-value	X^2/df	CFI	GFI	RMSEA	AIC
Three-factor original OSIVQ	27.61	24.0	.28	1.15	.97	/	.03	/
Three-factor with 45 items	2459.8	942	.001	2.61	.62	.72	.07	2645.8
Three-factor with 34 items	1156.1	524	.001	2.21	.79	.82	.06	1298.1
Two-factor with 34 items	2087.3	526	.001	3.97	.48	.61	.09	2225.3

Table 3. Matrix of correlations among the OSIVQ spatial, object and verbal scores and paper-and-pencil measures

Measure	1	2	3	4	5	6
1. Spatial score	__	.04	-.17**	-.01	**.54****	.04
2. Object score		__	.15**	**.50****	-.05	-.17*
3. Verbal score			__	.02	**-.29****	**.32****
4. VVIQ				__	-.05	-.05
5. MRT					__	-.01
6. Mill Hill						__

** $p < .01$

* $p < .05$

Supplementary material

Questionnaire d'Imagerie Spatiale-Objet et Verbal (OSIVQ)

*Ceci est un questionnaire sur votre façon de penser. Merci de lire attentivement les affirmations suivantes et d'évaluer chacune d'elles sur une échelle de 5 points. Encerclez le «**5**» pour indiquer que vous êtes **absolument d'accord** avec l'énoncé. Encerclez le «**1**» pour indiquer que vous êtes **totalement en désaccord** avec cet énoncé. Entourez «**3**» si vous n'êtes **pas sûr**, mais essayez de faire un choix. Il est très important que vous répondiez à toutes les affirmations du questionnaire.*

1	Quand j'étais étudiant(e), j'étais très bon(ne) en géométrie 3D	1 - 2 - 3 - 4 - 5
2	Il est difficile pour moi de m'exprimer par écrit	1 - 2 - 3 - 4 - 5
3	Si on me demandait de choisir entre un métier d'ingénieur et un métier dans les arts visuels, je choisirais ingénieur	1 - 2 - 3 - 4 - 5
4	Mes compétences verbales rendraient une carrière dans les langues relativement facile pour moi	1 - 2 - 3 - 4 - 5
5	L'architecture m'intéresse plus que la peinture	1 - 2 - 3 - 4 - 5
6	Mes images mentales sont très colorées et claires	1 - 2 - 3 - 4 - 5
7	Je préfère les diagrammes schématiques et les croquis quand je lis un manuel plutôt que des illustrations imagées	1 - 2 - 3 - 4 - 5
8	J'ai plus de facilité à raconter des blagues et des histoires que la plupart des gens	1 - 2 - 3 - 4 - 5
9	Il est difficile pour moi de rédiger des dissertations et je n'aime pas du tout faire ça	1 - 2 - 3 - 4 - 5
10	Mes images mentales sont plus comme des représentations schématiques des choses et des évènements que comme des images détaillées	1 - 2 - 3 - 4 - 5
11	Quand je lis de la fiction, je me forme habituellement une image mentale claire et détaillée d'une scène ou d'une pièce qui a été décrite	1 - 2 - 3 - 4 - 5
12	Si on me demandait de choisir entre un métier d'ingénieur et un métier dans les arts visuels, je choisirais les arts visuels	1 - 2 - 3 - 4 - 5

13	J’ai une mémoire photographique	1 - 2 - 3 - 4 - 5
14	Je peux facilement imaginer et faire pivoter mentalement des figures géométriques tridimensionnelles	1 - 2 - 3 - 4 - 5
15	J’aime les images avec des couleurs vives et des formes inhabituelles comme celles en art moderne	1 - 2 - 3 - 4 - 5
16	Mes compétences verbales sont excellentes	1 - 2 - 3 - 4 - 5
17	Lorsque je pense à un concept abstrait (ou à une construction), j’imagine mentalement une construction abstraite schématique ou son plan plutôt qu’une construction spécifique concrète	1 - 2 - 3 - 4 - 5
18	Lorsque j’entre dans un magasin familier pour obtenir un article spécifique, je peux facilement visualiser la localisation exacte de cet article, l’étagère sur laquelle il se trouve, comment il est arrangé et les articles environnants	1 - 2 - 3 - 4 - 5
19	Il est beaucoup plus facile pour moi d’assembler des meubles (par exemple, un meuble de télévision ou une chaise) lorsque j’ai des instructions verbales détaillées que lorsque je n’ai qu’un schéma ou une image	1 - 2 - 3 - 4 - 5
20	Mes images mentales sont très vives et photographiques	1 - 2 - 3 - 4 - 5
21	Quand j’explique quelque chose, je préfère donner des explications verbales plutôt que de faire des dessins ou des croquis	1 - 2 - 3 - 4 - 5
22	Si quelqu’un devait me donner des nombres à deux chiffres à additionner (par exemple, 43 et 32), je ferais simplement l’addition sans visualiser les nombres	1 - 2 - 3 - 4 - 5
23	Mes images mentales de différents objets ressemblent beaucoup, en termes de taille, de forme et de couleur, aux vrais objets que j’ai vus	1 - 2 - 3 - 4 - 5
24	Habituellement, je n’essaie pas de visualiser ou de dessiner des diagrammes lors de la lecture d’un manuel	1 - 2 - 3 - 4 - 5
25	Normalement, je n’ai pas l’expérience de beaucoup d’images vives spontanées. J’utilise mon imagerie mentale surtout lorsque j’essaie de résoudre certains problèmes comme ceux en mathématiques	1 - 2 - 3 - 4 - 5
26	Quand j’imagine le visage d’un ami, j’ai une image parfaitement claire et précise	1 - 2 - 3 - 4 - 5
27	J'ai d'excellentes capacités en graphisme technique	1 - 2 - 3 - 4 - 5
28	Quand je me rappelle d’une scène, j’utilise des descriptions verbales plutôt que des images mentales	1 - 2 - 3 - 4 - 5

29	Je peux facilement me rappeler d'un très grand nombre de détails visuels que quelqu'un d'autre pourrait ne jamais remarquer. Par exemple, j'enregistre automatiquement certaines choses comme de quelle couleur est la chemise que quelqu'un porte ou de quelle couleur sont ses chaussures	1 - 2 - 3 - 4 - 5
30	Je peux facilement dessiner un plan d'un bâtiment que je connais bien	1 - 2 - 3 - 4 - 5
31	A l'école, je n'avais pas de problèmes avec la géométrie	1 - 2 - 3 - 4 - 5
32	Je suis bon(ne) pour jouer à des jeux spatiaux impliquant la construction à partir de blocs et de papier (par exemple : Lego, Tetris, Origami)	1 - 2 - 3 - 4 - 5
33	Parfois, mes images mentales sont tellement vives et persistantes qu'il est difficile de les ignorer	1 - 2 - 3 - 4 - 5
34	Je peux fermer les yeux et facilement percevoir une image d'une scène que j'ai vécue	1 - 2 - 3 - 4 - 5
35	Les mots me viennent plus facilement que la moyenne	1 - 2 - 3 - 4 - 5
36	Je préférerais avoir une description verbale d'un objet ou d'une personne plutôt qu'une photo	1 - 2 - 3 - 4 - 5
37	Je suis toujours conscient(e) de la structure des phrases	1 - 2 - 3 - 4 - 5
38	Mes images sont plus schématiques que colorées et photographiques	1 - 2 - 3 - 4 - 5
39	J'apprécie d'être capable de reformuler mes pensées de nombreuses façons, par souci de variation, à la fois à l'écrit et à l'oral	1 - 2 - 3 - 4 - 5
40	Je me rappelle de tout visuellement. Je peux décrire ce que les gens portaient au diner et je peux parler de comment ils étaient assis et de quoi ils avaient l'air, et ce, avec probablement plus de détails que je ne pourrais discuter de ce qu'ils ont dit	1 - 2 - 3 - 4 - 5
41	J'ai parfois un problème pour exprimer exactement ce que je veux dire	1 - 2 - 3 - 4 - 5
42	Je trouve cela difficile d'imaginer à quoi ressemblerait exactement une figure géométrique tridimensionnelle lors d'une rotation	1 - 2 - 3 - 4 - 5
43	Mes images visuelles sont dans ma tête tout le temps. Elles sont justes là	1 - 2 - 3 - 4 - 5
44	Mes capacités graphiques rendraient une carrière dans l'architecture relativement facile pour moi	1 - 2 - 3 - 4 - 5
45	Quand j'entends un animateur radio ou un DJ que je n'ai jamais réellement vu, je me retrouve généralement à imaginer à quoi il pourrait ressembler	1 - 2 - 3 - 4 - 5