

## **Vividness and Control of Mental Imagery: A Psychometric Analysis**

JOHN F. KIHSTROM, MARTHA L. GLISKY, MARY A. PETERSON,  
ERIN M. HARVEY, and PATRICIA M. ROSE  
University of Arizona

In a study of the relations between vividness and control of mental imagery, a total of 2,083 subjects completed the shortened form of Betts' QMI and Gordon's TVIC; another 730 subjects completed Marks' VVIQ and the TVIC. Distributions of responses on all three scales were highly skewed, with most subjects reporting at least moderately clear and vivid images. Factor analysis yielded 7 factors in QMI, 4 factors in VVIQ, and 2 to 4 factors (depending on the sample) in the TVIC. Although VVIQ was intended as an expansion of the visual imagery subscale of QMI (QMI/V), TVIC was significantly more highly correlated with VVIQ than with QMI/V — a difference that was not due to sampling effects, differential reliability, or restriction of range. The available imagery questionnaires confuse the dimensions of vividness and control, fail to apply coherent definitions of either attribute of imagery, and are relatively insensitive to individual differences in imagery ability.

Over the last quarter-century, the study of mental images has progressed from a reliance on introspective self-reports of imaginal experience to analyses of the processes underlying their manipulation and use on experimental tasks (for historical reviews, see Hilgard, 1981; Holt, 1964; Sheehan, 1978; for accounts of some contemporary issues, see Block, 1981; Kihlstrom, 1981; Kosslyn, 1980; Shepard & Cooper, 1982; Yuille, 1983). In the course of this research, various questionnaire measures have been devised in an attempt to capture individual differences in imagery skill. Among the most popular of these are the shortened form of Betts' Questionnaire upon Mental Imagery (QMI; Betts, 1909; Sheehan, 1967), Marks' Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1973), and Gordon's Test of Visual Imagery Control (TVIC; Gordon, 1949).

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Authors' address: Amnesia and Cognition Unit, Department of Psychology, University of Arizona, Tucson, Arizona 85721. Send reprint requests to first-named author.

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Analyses of data derived from these questionnaires have yielded a number of interesting facts concerning the phenomenal experience of mental imagery (for recent reviews, see Sheehan, Ahston, & White, 1983; Tower & Singer, 1981; White, Sheehan, & Ashton, 1977). For example, there appears to be a strong general factor of imagery vividness, such that vividness in one domain (such as vision) is positively correlated with vividness in other domains (e.g., gustation). However, detailed analyses also reveal a small number of specific factors corresponding to the physiological substrates of the various sensory modalities, such as chemical (e.g., olfactory and gustatory) and mechanical (e.g., auditory and tactile). Self-ratings of vividness tend to be somewhat skewed, with most subjects claiming to experience at least moderately vivid images, and vanishingly few subjects reporting no imagery at all. Finally, images in some modalities (e.g., visual, auditory) tend to be more vivid than those in others (e.g., gustatory, olfactory). While this pattern may reflect little more than the relative familiarity of the various modalities, it also parallels the distribution of imagery in other domains. For example, visual and auditory imagery predominates in autobiographical memory, while olfactory and gustatory imagery is relatively absent (e.g., Kihlstrom & Harackiewicz, 1982).

While questionnaire measures seem to reveal clear individual differences in vividness and control of mental imagery (e.g., White, Ashton, & Brown, 1977), it has been difficult to show that these differences have any functional significance. Although Marks (1983) reviewed results showing that VVIQ scores correlated significantly with performance on a variety of tasks involving perception and memory, other reviewers have been less sanguine (e.g., Ernest, 1977; Finke, 1980; Katz, 1983; Lorenz & Neisser, 1985; Richardson, 1980; Sheehan et al., 1983; Tower & Singer, 1981; White et al., 1977). For example, while scores on the various imagery scales (such as QMI and VVIQ) often correlate highly with each other, establishing a kind of convergent validity, they do not correlate reliably with performance on tests of spatial ability, mental rotation, or image scanning. Reisberg and his colleagues have consistently found that VVIQ scores predict subjects' ability to remember details of the visual appearance of objects; somewhat surprisingly, however, the correlation consistently obtained is *negative*, meaning that vivid imagers are *less* accurate than their counterparts with more vague and fragmentary images (for a review, see Reisberg & Heuer, 1988, 1989).

In the course of conducting research on the relationship between visual perception and imagery (Peterson, Kihlstrom, Rose, & Glisky, 1991), we have administered various scales measuring the vividness and control of mental imagery to large pools of subjects. When it came to selecting subjects for our experiments, we were struck by the absence of contemporary norms for interpreting scale scores. In this paper, we briefly report norms for several of these instruments on a new generation of college students, and point out some heretofore unappreciated aspects of vividness, control, and the relationships between them.

## Method

### *Subjects and Procedure*

The data analyzed in this report was taken from three samples of college students enrolled in introductory psychology courses, who received either the QMI or the VVIQ, each coupled with the TVIC, during a routine survey session conducted near the beginning of the semester. A total of 1,470 subjects at the University of Wisconsin completed the QMI and TVIC in the spring semester of 1986; another 613 subjects completed these same questionnaires at the University of Arizona in the fall semester of 1987. Finally, a total of 730 University of Arizona students completed the VVIQ and TVIC in the spring semester of 1989. In the Wisconsin sample, the subjects received extra credit through the research participation option of the course. In all samples, the subjects were informed that their responses to the questionnaires might make them eligible to participate in experiments offered under the research participation requirement of the course. The subjects completed the questionnaires at their own pace, usually requiring less than 10 minutes for the task.

### *Materials*

The shortened form Betts' (1909) QMI (Sheehan, 1967) consists of a total of 35 items, with five items in each of seven subscales tapping visual, auditory, tactile (cutaneous), kinesthetic, gustatory, olfactory, and organic (whole body) imagery. For example, subjects are asked to imagine "the sun as it is sinking below the horizon," and then to rate the vividness of the resulting image on a 7-point scale ranging from "Perfectly clear and as vivid as the actual experience" to "No image present at all, only knowing that you are thinking of the object." In this research, we were particularly interested in the visual imagery subscale of the QMI, henceforth referred to as QMI/V.

Marks' (1973) VVIQ was intended to be an expansion of the QMI/V. It consists of 16 items, 4 items relating to each of 4 different images (viz., that of a relative or friend, a rising sun, a familiar shop, a country scene), and employs a 5-point scale with the same endpoints as the QMI.

Gordon's (1949) TVIC is concerned with subjects' ability to voluntarily manipulate or control mental images, irrespective of their vividness. It consists of a series of 12 items, all involving an automobile which goes through various transformations (e.g., stopped, lying upside down, climbing up a hill, falling off a bridge). For each item, subjects are asked to indicate whether they can imagine the requested scene. The subjects at Wisconsin and Arizona who completed the TVIC along with the QMI made their responses on Gordon's original 3-point scale labelled "Yes," "Unsure," and "No." For the Arizona subjects who completed the TVIC with the VVIQ, however, the scale was expanded to 5 points, retaining the original anchor labels, in an attempt to facilitate the expression of individual differences.

## Results

### *Distribution of Imagery Vividness and Control*

**QMI.** Of the 2,083 subjects who received the QMI in both institutions, a total of 2,036 completed the scale. Table 1 shows the means and standard deviations on each of the seven subscales of the questionnaire. Since low scores on the test reflect vivid mental imagery, and the midpoint on each subscale corresponds to a score of 20, it is apparent that the subscale distributions are substantially skewed, with the average subject claiming to experience at least moderately clear and vivid images (corresponding to a mean value of 3 or less on the 7-point scale) in each domain. Depending on the subscale, only 1% to 2% of the subjects reported that their images were at best vague and dim (corresponding to a mean value of 6 or more on the 7-point scale).

A within-subjects analysis of variance yielded a significant main effect of subscale,  $F(6, 12,210) = 212.67$ . "Organic" imagery, involving such experiences as fatigue and drowsiness, was the most vivid. Of the individual imagery modalities, vision yielded the most vivid images, olfaction the least.

Table 1  
Means and Standard Deviations for QMI Subscales

Subscale	M	SD
Visual	11.60	4.40
Auditory	12.58	4.64
Tactile	12.04	4.60
Kinesthetic	12.10	4.60
Gustatory	12.70	5.13
Olfactory	14.44	5.49
Organic	10.83	4.27

$N = 2,036$

**VIQ.** A total of 730 subjects returned completed questionnaires. The mean score was 33.31 ( $SD = 11.76$ ), compared to a midpoint score corresponding to 48. Again, the skewness of the distribution indicates that most subjects claimed that their visual images were at least moderately clear and vivid (corresponding to a mean value of 3 or less on the 5-point scale). Fewer than 3% of the subjects reported that their images were vague and dim, or that they had no imagery at all.

**TVIC.** A total of 2,075 subjects completed the 3-point version, and another 730 subjects completed the 5-point version of the questionnaire. The mean scores were 16.73 ( $SD = 4.68$ ) against a midpoint of 24, and 23.61 ( $SD = 8.61$ ) against a midpoint of 36, respectively. Again, most subjects reported that they could experience the images requested. Fewer than 7% of the subjects, overall, reported that they could not produce the images as requested or doubted that they could do so.

### *Correlations among Imagery Measures*

**QMI and TVIC.** Table 2 presents the correlations among the QMI sub-

scales, and between each subscale and the 3-point TVIC, based on the 2,029 subjects who had complete data on both questionnaires. All the correlations were positive. However, the correlations between TVIC and the subscales of the QMI were all relatively low; the correlation between the QMI/V and TVIC was only  $r = 0.25$ .

Table 2  
Correlations among QMI and TVIC Subscales

		Vis	Aud	Tac	Betts			
					Kin	Gus	Olf	Org
Betts	Visual	---						
QMI	Auditory	.36						
	Tactile	.43	.54					
	Kinesthetic	.39	.54	.58				
	Gustatory	.36	.47	.59	.52			
	Olfactory	.33	.43	.53	.45	.55		
	Organic	.38	.39	.49	.49	.47	.48	
	Gordon	Total	.25	.21	.22	.25	.20	.18

$N = 2,029$

A principal-components factor analysis of the individual QMI and TVIC items, with orthogonal rotation, yielded 11 factors accounting for 57% of the total variance. The first seven factors corresponded closely to the seven subscales of the QMI, confirming the findings of White, Ashton, and Law (1974). Table 3 shows the remaining four factors, which comprised TVIC items: Factors 10 and 11 referred to the automobile at rest in a normal position, in color (Factor 10) or not (Factor 11); Factor 8 referred to the car in normal motion; Factor 9, to the car in unusual positions or motions. Ashton and White (1974) also found that the TVIC was factorially complex, with three factors corresponding to whether the car was standing still, in motion, or in a bizarre position (whether standing or moving).

Table 3  
Factor Loadings of Items on Gordon's Test of Visual Imagery Control

TVIC Item	QMI/TVIC Factor				VVIQ/TVIC Factor	
	8	9	10	11	1	4
1. Car standing in road	.23	.02	.23	.64	.63	.06
2. Car in color	.15	-.02	.83	.19	.74	-.06
3. Car in different color	.14	.21	.81	.10	.64	.14
4. Car upside down	.16	.59	.00	.42	.44	.59
5. Car upright again	.14	.26	.11	.71	.72	.27
6. Car moving on road	.70	.11	.10	.05	.79	.12
7. Car climbing hill	.84	.12	.02	.14	.77	.22
8. Car climbing over top	.82	.16	.03	.10	.70	.29
9. Car crashing through house	.13	.77	.06	.02	.21	.80
10. Car moving with couple inside	.45	.16	.27	.11	.59	.29
11. Car falls into stream	.15	.77	.04	.06	.25	.83
12. Car dismantled	.01	.68	.08	.04	.16	.74

*VVIQ and TVIC.* The correlation between VVIQ and the 5-point TVIC was  $r = 0.45$ . This value was significantly higher than the corresponding correlation between the TVIC and the QMI/V ( $r = 0.25, p < 0.001$ ). In interpreting this difference, it should be noted that most of the QMI data was collected at Wisconsin, whereas all the VVIQ data was collected at Arizona, thus raising the possibility of subject selection effects. However, the correlation between TVIC and the QMI/V, when calculated on the Arizona subsample alone, was  $r = 0.21$ . Thus, cohort differences cannot account for the differences observed between the correlations.

In addition, it should be noted that the QMI/V consists of only 5 items, while the VVIQ consists of 16 items (in fact, the first cluster of four VVIQ items is identical to the first four QMI/V items, while the first item in the second cluster of four VVIQ items is identical to the fifth QMI/V item). According to psychometric theory, the correlation between two variables increases with the reliability of their measurement, and, as a rule, longer scales are more reliable than shorter ones. Accordingly, the correlation was recomputed between TVIC and a VVIQ subscale consisting only of the first five items of the questionnaire (i.e., the items corresponding to the QMI/V subscale). This correlation was  $r = 0.36$ , which remains significantly higher than the  $r = 0.21$  obtained between QMI/V and TVIC in the Arizona subsample ( $p < 0.05$ ). Thus, the difference between the correlations cannot be accounted for by differences between QMI and VVIQ in reliability or restriction of range.

On the other hand, the subjects in the QMI/TVIC sample completed the original 3-point version of TVIC, while those in the VVIQ/TVIC sample completed a 5-point revision. Since most people report that they are able to produce the requested images on TVIC, it may be that the 3-point version restricted the range of possible scores available to subjects in the QMI/TVIC sample. In order to investigate this possibility, the 5-point scales for the TVIC items in the VVIQ/TVIC sample were collapsed to 3-point ones by combining the two positive scale values (i.e., 1 and 2), and the two negative scale values (i.e., 4 and 5) together. The resulting distribution of TVIC scores closely resembled that obtained in the QMI/TVIC sample. Nevertheless, the correlation fell only to  $r = 0.41$  with the full VVIQ score, and to  $r = 0.32$  with the VVIQ subscale corresponding to QMI/V. Both values are significantly higher than the value of  $r = 0.21$  obtained between TVIC and QMI/V in the Arizona subsample ( $p < 0.05$ ). Thus, the different correlations obtained between TVIC and QMI/V, and between TVIC and VVIQ, cannot be accounted for by restrictions in the range of TVIC scores.

A principal-components factor analysis of the individual VVIQ and TVIC items, with orthogonal rotation, yielded six factors accounting for 64% of the total variance. Four of the factors (Factors 2, 3, 5, and 6) corresponded to the four content clusters of the VVIQ. Table 3 shows that the

remaining two factors comprised TVIC items — Factor 1 consisting of items referring to the automobile in normal positions or motions; Factor 4, to the car in unusual positions or motions.

### Discussion

One of the most striking findings to emerge from our analyses is that the distribution of mental imagery ability, whether construed in terms of questionnaire-based estimates of vividness or control, is highly skewed. While scores on these scales might be inflated somewhat by the desire of subjects in an experimental pool to participate in further experiments, distributions of similar form have been obtained under other conditions of testing. Therefore, as Sheehan (1967) has noted, it appears that few subjects lack the ability to produce the images requested by these questionnaires. If a self-rating of “moderately clear and vivid” is taken as the threshold for affirming that one has formed a mental image, then the endorsement rates for the QMI items vary from 48.4% to 93.8%, with a mean of 80.82% ( $SD = 10.78$ ); and for VVIQ items from 76.8% to 94.4% ( $M = 87.26$ ,  $SD = 4.78$ )<sup>1</sup>. Fewer than 10% of the subjects (far fewer on QMI and VVIQ) yielded scores indicating that their images were vague and dim, or that they had no imagery at all. Psychometric principles of test construction usually require a distribution of item difficulties, averaging about 50%. Compared against this standard, the QMI and VVIQ are very “easy” tests.

This psychometric fact has serious implications for the use of these tests in selecting subjects for experiments on mental imagery. In the first place, the common practice in imagery experiments of administering the tests to a small random sample of subjects, and then correlating imagery test scores with performance on some experimental task, will rarely reveal an effect of individual differences. This is because the variance of imagery scores in any unselected subject group is likely to be very low. And if the variance of imagery scores is low, then such scores cannot serve as strong predictors of performance on some experimental test.

The obvious solution to this problem is to select experimental subjects from the extremes of the distribution of the test scores. In our own research, for example, we compared subjects scoring in the first and fourth quartiles on both VVIQ and TVIC (Peterson et al., 1989). Unfortunately, the skewed distribution of imagery scores vitiates even this solution. For example, in

<sup>1</sup>The TVIC shares this problem. The 12 items of the original 3-point version have endorsement rates varying from 55.8% to 95.9% ( $M = 77.12$ ,  $SD = 13.25$ ), with most of the low endorsement rates accounted for by the few unusual or bizarre images. It was in an attempt to increase the dispersion of scores on the TVIC that we introduced the 5-point scale used in the VVIQ sample.

our data the cutpoint for the VVIQ "low vividness" group was 39 on a 60-point scale. If a subject reported experiencing a "moderately clear and vivid" image in response to each item, he or she would have a score of 36, while a rating of "vague and dim" on every item would produce a score of 48. Thus, even with an extremely large population of subjects to choose from, the group of ostensibly poor imagers actually included many subjects whose ability to form at least some images may have been fairly good. The typical failure of individual differences on imagery vividness to reliably predict performance on experimental tests of imagery may be due to the failure of the available tests to capture the full range of imagery ability. Alternatively, it may be that even "vague and dim" images are sufficient for adequate performance on most experimental imagery tasks.

Another striking feature of our results was the differential correlation of the TVIC, ostensibly a measure of imagery control, with the VVIQ and the QMI/V. The VVIQ has generally been considered to be a more reliable extension of the QMI/V, but in our data, the TVIC correlated much more highly with VVIQ scores than with QMI/V — a difference that cannot be accounted for by cohort effects, differential reliability, or restrictions in range. It appears that the VVIQ, while intended as an extension of QMI/V and thus as a measure of imagery vividness, may also tap some aspects of controllability. For example, the four successive items in each of the four clusters of the VVIQ may be interpreted as manipulations or transformations of a single basic image of a relative or friend, a sunrise, a shop, and a landscape. Although the subjects are asked to rate the vividness of each image, most VVIQ items represent the manipulation of a prior image, much in the manner of the TVIC items.

In retrospect, it appears that the QMI, VVIQ, and TVIC do not provide unambiguous assessments of either the vividness or controllability of mental images. As noted previously, in many items of the VVIQ the subject is transforming the image in a way that seems very similar to the control measured by the TVIC. Likewise, many of the TVIC questions, such as those referring to the car in a stationary position, seem to pertain to vividness at least as much as they do to control. Even assuming that the questionnaire items measure what they are intended to measure, important questions remain unaddressed. Within the vividness dimension, for example, the complexity of the image requested, and the precision of the attendant details required, have not been controlled. For example, the items in some clusters of VVIQ refer to very complex images, while others refer to more schematic, prototypical scenes. And it is unclear whether vividness should be construed in terms of color brightness, clarity of contours, preservation of precise detail, or some other feature of the image. Within the controllability dimension, many of the TVIC items can be endorsed by calling up a new image, rather than by manipulating one that has been established previously (see also Chambers & Reisberg 1985). And various



aspects of manipulation, for example taking a different perspective on a scene, focusing on some precise detail, or transforming one or more features, are not clearly distinguished.

- Even so, considerations of psychometric theory cast doubt on any relationship between vividness and controllability measured with the currently available scales. Arguably, vividness and controllability are conceptually quite different: one could have a very vivid mental image but be unable to manipulate it, for example. And, indeed, the correlations obtained between measures of vividness and control are relatively low, even if they are positive and statistically significant.<sup>2</sup> Unfortunately, the peculiarities of the distributions of QMI/V, VVIQ, and TVIC scores also call this empirically observed independence into question. Correlations express the degree to which variability in one measure can be accounted for by variability in another, and the correlation between two test scores is constrained by the variability of the scores themselves. In the present instance, the variability of QMI/V, VVIQ, and TVIC scores is relatively low: the vast majority of subjects score high on the dimensions measured. The true correlation between vividness and controllability can only be determined with measures that include items tapping a wider range of difficulty levels.

In summary, perhaps the most important conclusion from the present research is that the instruments currently available for assessing individual differences in mental imagery ability are not completely satisfactory. Definitive conclusions on the functional significance of these differences, in terms of their ability to predict performance on criterion tests of imagery ability, require the development of new measures whose items reflect a wider range of difficulty levels, and that make clearer distinctions between the dimensions of vividness and controllability.

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<sup>2</sup>In the factor analyses performed for this research, TVIC items loaded on the first factor of each unrotated solution, along with QMI or VVIQ items. In the rotated solutions, however, TVIC items showed highest loadings on their own unique factors.

#### REFERENCES

- Ashton, R., & White, K. (1974). Factor analysis of the Gordon test of visual imagery control. *Perceptual and Motor Skills*, 38, 945-946.
- Betts, C.H. (1909). The distribution and functions of mental imagery. *Teachers' College Columbia University Contributions to Education*, 26, 1-99.
- Block, N. (1981). *Imagery*. Cambridge: MIT Press.
- Chambers, D., & Reisberg, D. (1985). Can mental images be ambiguous? *Journal of Experimental Psychology: Human Perception and Performance*, 11, 317-328.
- Ernest, C. (1977). Imagery ability and cognition: A critical review. *Journal of Mental Imagery*, 2, 181-216.
- Finke, R. (1980). Levels of equivalence in imagery and perception. *Psychological Review*, 87, 113-132.

- Gordon, R. (1949). An investigation into some of the factors that favour the formation of stereotyped images. *British Journal of Psychology*, 39, 156-167.
- Hilgard, E.R. (1981). Imagery and imagination in American psychology. *Journal of Mental Imagery*, 5, 5-66.
- Holt, R.R. (1964). Imagery: The return of the ostracized. *American Psychologist*, 12, 254-264.
- Katz, A. (1983). What does it mean to be a high imager? In J. Yuille (Ed.), *Imagery, memory, and cognition* (pp. 39-63). Hillsdale, NJ: Erlbaum.
- Kihlstrom, J.F. (1981). Puzzles of imagery. *Journal of Mental Imagery*, 5, 42-44.
- Kihlstrom, J.F., & Harackiewicz, J.M. (1982). The earliest recollection: A new survey. *Journal of Personality*, 50, 134-148.
- Kosslyn, S.M. (1980). *Image and mind*. Cambridge: Harvard University Press.
- Lorenz, C., & Neisser, U. (1985). Factors of imagery and event recall. *Memory and Cognition*, 13, 494-500.
- Marks, D.F. (1973). Visual imagery in the recall of pictures. *British Journal of Psychology*, 64, 17-24.
- Marks, D. (1983). Mental imagery and consciousness: A theoretical review. In A. Sheikh (Ed.), *Imagery: Current theory, research, and application* (pp. 96-130). New York: Wiley.
- Peterson, M.A., Kihlstrom, J.F., Rose, P.M., & Glisky, M.L. (1991). *Mental images can be ambiguous: Parts, wholes, and strategies*. Manuscript in preparation, University of Arizona.
- Reisberg, D., & Heuer, F. (1988). Vividness, vagueness, and the quantification of visualizing. *Journal of Mental Imagery*, 12(3&4), 89-102.
- Reisberg, D., & Heuer, F. (1989). *The consequences of vivid imagery: An empirical handle on the function of phenomenal states?* Unpublished manuscript, Reed College.
- Richardson, J. (1980). *Mental imagery and human memory*. New York: St. Martin's.
- Sheehan, P.W. (1967). A shortened form of Betts' Questionnaire upon Mental Imagery. *Journal of Clinical Psychology*, 23, 386-389.
- Sheehan, P.W. (1978). Mental imagery. In B.M. Foss (Ed.), *Psychology survey*, No. 1 (pp. 58-70). London: Allen & Unwin.
- Sheehan, P.W., Ashton, R., & White, K. (1983). Assessment of mental imagery. In A.A. Sheikh (Ed.), *Imagery: Current theory, research, and application* (pp. 189-221). New York: Wiley-Interscience.
- Shepard, R.N., & Cooper, L.A. (1982). *Mental images and their transformations*. Cambridge: MIT Press.
- Tower, R.B., & Singer, J.L. (1981). The measurement of imagery: How can it be clinically useful? In P.C. Kendall & S.D. Hollon (Eds.), *Assessment strategies for cognitive-behavioral interventions* (pp. 119-159). New York: Academic.
- White, K., Ashton, R., & Brown, R.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.
- White, K., Ashton, R., & Law, H. (1974). Factor analyses of the shortened form of Betts' Questionnaire upon Mental Imagery. *Australian Journal of Psychology*, 26, 183-190.
- White, K., Sheehan, P.W., & Ashton, R. (1977). Imagery assessment: A survey of self-report measures. *Journal of Mental Imagery*, 1, 145-170.
- Yuille, J.C. (1983). *Imagery, memory, and cognition: Essays in honor of Allan Paivio*. Hillsdale, NJ: Erlbaum.