Visual or Symbolic, Analytic or Holistic: A Comparison of the Cognitive Styles of South-East Asian and Australian Students

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Abstract

Many factors are involved in the way an individual gains an understanding of Mathematics. Their cognitive style i.e. the way they code information for further processing in the brain is one of these. Riding and Rayner (1998) have a developed a model for the whole learning process which contains two dimensions of cognitive style. This study investigates the effect of cultural factors on cognitive style, looking particularly at the cultures of South-East Asia and Australia and the cognitive styles of students undertaking a first year university Mathematics course. Students from South-East Asia tended to have a more visual cognitive style than Australian students, particularly when they learnt to read first in a character-based language.

Key Words

Cognitive style, Students from South-East Asia and Australia

Introduction

"Teachers who take styles into account can show sensitivity to cultural and individual diversity that is so often absent in the classroom." (Sternberg & Zhang, 2001, p. viii). Within the context of learning, a very large number of styles and dimensions within styles have been suggested and measured through the development of relevant tests. Sternberg (1997) drew together many cognitive and learning styles from other researchers and expanded them into a profile of styles to explain a student's preferred way of thinking. Kolb (2001) has developed a theory of learning styles which is activity centred and focuses on the learning process, a process where knowledge is created through the transformation of experience.

A group of other researchers have taken an approach to learning style that is based on what the students actually learn, their understanding of how they do this and the motives underlying learning. Marton and Saljo (1976), Entwistle (1988) and Biggs and Watkins (1996) have all proposed, refined and developed measures for "deep and surface approaches" to learning. Entwistle added a "strategic approach" and Biggs added an "achieving approach". However, when Marton (1996) and Biggs (1996) moved to conducting research in Hong Kong and China, some discrepancies occurred which they described as "the paradox of the Chinese learner". This led to a study of different methods of memorization, a greater appreciation of the Confucian-based method of learning, and another rethinking of the model.

Following on the work of Witkin (1987), Riding and his colleagues developed a model for the more specific concept of cognitive style. He defines cognitive style as "an individual's preferred and habitual approach to organizing and representing information." (Riding & Rayner, 1998, p.8)

Riding developed a theory involving two dimensions (Riding & Cheema, 1991). He named the two dimensions the "Wholist-Analytic" dimension and the "Verbal-Imagery" dimension. The Wholist-Analytic Style dimension is one in which "an individual tends to *organize* information in wholes or parts" and the Verbal-Imagery Style dimension is one where "an individual is inclined to *represent* information during thinking verbally or in mental pictures" (Riding, 2000a, p. 316). Thus both of these dimensions are bi-polar.

Riding (2000) lists conditions that are necessary for cognitive style in general and the two dimensions that they have identified in particular to be valid as a construct. These are the independence of the style dimensions, and the dimensions' independence from intelligence and personality dimensions. The independence of the style dimensions has been

demonstrated in a number of studies (Riding & Al-Salih, 2000; Riding, Burton, Rees, & Sharrat, 1995; Riding & Douglas, 1993). There are also a number of studies relating the cognitive style dimensions to observed learning behaviour (Riding & Watts, 1997: Riding & Read, 1996: Sadler-Smith & Riding, 1999; Riding & Rayner, 1995). Evidence for the physiological basis for cognitive style was found in two studies (Riding, Glass & Douglas, 1993; Riding, Glass, Butler & Pleydell-Pearce, 1997). Riding and Rayner (1998) state that no gender differences appear to exist with respect to cognitive style.

Riding (1991) developed a test for cognitive style and in doing so he attempted to avoid the limitations that existed in other tests for cognitive style which all took the form of a self-report questionnaire. These limitations include difficulty with objectivity about introspection, whether a respondent actually understands what is being asked, and when a respondent does not answer completely honestly.

In developing his test, Riding (1991) turned to three computer-generated subtests which measure response times and from these times the computer calculates two ratios which locate the respondent on each of the two cognitive style dimensions. The first subtest presents the subject with statements about the similarity of two items which are to be judged true or false. In half of the statements, the basis of comparison is the colour of items, which is most easily processed in a pictorial way, while in the other half of the statements, the basis of comparison is the category type of the items, most easily processed in a verbal or semantic manner. Imagers can be expected to respond more quickly to the colour comparisons and Verbalisers will process the category type comparisons more rapidly. This method assesses both ends of cognitive style dimension with the same strength and value and it reduces the amount of reading to a minimum thus overcoming much of the problem created by respondents having limited reading ability. As both the colour and the category type items must be read, any effect of reading speed would be exhibited for both imagery and verbal response times and thus would be factored out by the use of the ratio. As respondents are not told that the assessment uses response times, they should process the information in the way that they normally do and in a relaxed fashion (Rayner, 2000).

The second and third subtests measure the two ends of the of Wholist-Analytic dimension. In the second subtest, the respondent is presented with pairs of complex geometric figures and asked to judge whether they are the same or different. It is assumed that Wholists will make this judgement more quickly. Some respondents who score towards the Analytic end of the dimension can be seen moving their head and their eyes back and forward between the two figures checking each detail separately before finally responding. In the third subtest, two figures are again present. One is a simple geometric figure such as a triangle with a particular orientation or a square and the other is a complex geometric figure. The respondent is asked to indicate whether the simple shape, with the same orientation, is included in the complex figure. Ratios for the response times for each of the subtests are calculated and used to locate each respondent in their appropriate position on the Wholist-Analytic dimension.

Is the CSA culture free?

Finally, Riding states that "it [the CSA] is probably culture free" (Riding, 2000a, p. 319). This claim needs to be considered carefully in relation to the first subtest where comparisons are made between objects designated by words; vocabulary could become a factor. For example, a student from Indonesia or Singapore would neither be able to visualize nor be able to categorize the object indicated by the words "ivy". Respondents must in this situation guess to make a response. It is possible that the number of items requiring a guess would be evenly distributed across the two categories and the time taken for these guesses would be consistent between items. If this is so, then the ratio determining a respondent's position on the dimension will not be affected by the vocabulary problem. There is no equivalent problem with the use of geometric figures. Respondents who have a large amount of experience with geometric figures or who have learnt to read in a character-based language would perhaps respond more quickly to both subtests but this effect would be removed by the use of the ratio.

Cognitive Style and Country of Origin

Closely associated with the degree to which the Cognitive Styles Analysis is culture-free and not completely separate from it, is the question of whether people from different cultures are more inclined to fall at one end or other of each of the cognitive style dimensions. This question also links closely with the question as to whether style is innate or a result of training and therefore able to be changed and developed. Any differences that do exist between people from different cultures in relation to cognitive style could either be innate or due to the training, particularly early training, given within the different cultures. Most of the research using the CSA has been conducted in England. Borg and Riding (1993) used Riding's test to measure the cognitive style of teachers in Malta. Riding and Agrell (1997) also measured the cognitive styles of secondary school students in Canada.

While there is a variation between the values of these measures for each dimension for different studies, the variation for the study conducted outside England is no greater than that between the studies conducted in England. The present study looks at the placement of two groups of students on these two cognitive style dimensions. They are students who have been educated in a country in South East Asia and students who have been educated in Australia. Therefore, the following research questions are relevant.

Research Question

(a) *Are there differences between the scores on the Verbaliser-Imager dimension of the CSA for students who were educated in South East Asia and the scores of students educated in Australia*

(b) *Are there differences between the scores on the Wholist-Analyser dimension of the CSA for students who were educated in South East Asia and the scores of students educated in Australia*

Methodology

Ninety subjects, all of whom were studying in their first semester of their first year of Mathematics at a university in Melbourne, Australia, were tested. Forty-five of these subjects were classified as Australian students (28 males and 17 females) because they had undertaken all of their secondary education in mathematics in Australia. The other forty-five subjects (27 males and 17 females) were classified as overseas students as they had undertaken their secondary education in a country in South East Asia.

Each of these students responded to the Riding Cognitive Styles Analysis (CSA) (Riding, 1991) which is a computerised test. Based on response times, each subject is classified as falling somewhere along each of the two dimensions - the Verbaliser/Bimodal/Imager dimension and the Wholist/Intermediate/Analytic dimension. The computer gives both a ratio and a classification for each subject for each dimension. The ratio for the Verbaliser/Imager dimension is obtained by dividing the total of the response times to conceptual category statements by the total of the response times for the appearance statements. Because Verbalisers will respond more quickly to the conceptual category items and more slowly to the appearance items, a small value ratio indicates a Verbaliser. Imagers react more slowly to the conceptual category items and more quickly to the appearance items, giving a larger value to the ratio. The ratio for the Wholist/Analytic dimension is obtained by dividing the total of the response times when comparing pairs of complex geometric figures by the total of the response times to a series of tasks involving the disembedding of simple shapes from within complex geometrical figures. Wholists will respond more quickly to the comparison tasks and more slowly to the disembedding tasks giving a low ratio while Analytics will respond slowly to the comparison task and more quickly to the disembedding giving a larger value to the ratio (Riding & Cheema, 1991).

Results

The results of analyses of variance, which were conducted using the variables of Sex and Country as the independent variables and the ratios for both dimensions of the CSA as the

dependent variables, are shown in Table 2. No significant main effect was found for the variable Sex for either Riding dimension.

As shown in Table 1 below, the mean for the overseas students on the Verbaliser/Imager dimension was higher than that for the Australian students, indicating that the overseas students tended to fall more to the Imager end of the dimension. From Table 2 it can be seen that this Country main effect was significant ($p < .05$). With $\square^2 = .06$, only 6% of the variance is accounted for by this variable.

As shown in Table 1 below, the mean for the overseas students on the Wholist/Analytic dimension was higher than that for the Australian students, indicating that the overseas students tended to fall more to the Analytic end of the dimension. However, as indicated in Table 2, there was no significant effect for Country for this dimension.

Table 1

Means and Standard Deviations for the Ratios on Both Dimensions of the CSA for the Country and Sex Variables.

Verbaliser/Imager	Overseas		Australian		All	
	M	*SD*	*M*	*SD*	*M*	*SD*
Male	1.11	0.12	0.99	0.10	1.05	0.13
Female	1.03	0.14	1.05	0.15	1.04	0.14
All	1.08	0.13	1.01	0.12		
Wholist/Analytic	Overseas		Australian		All	
	M	*SD*	*M*	*SD*	*M*	*SD*
Male	1.22	0.37	1.19	0.36	1.21	0.36
Female	1.35	0.42	1.18	0.34	1.26	0.38
All	1.27	0.39	1.19	0.35		

Table 2

Analyses of Variance for Sex, Country and the Ratios for Both Dimensions of the CSA

		Verbaliser/Imager		Wholistic/Analytic	
Source	*df*	*F*	$\square^2$	*F*	$\square^2$
Country	1	6.05*	.06	1.42	.00
Sex	1	0.04	.00	0.50	.01
Country X Sex	1	6.48*	.07	0.68	.01
Within-group error	83	(0.02)		(0.02)	

Note. Values enclosed in parentheses represent mean square errors.

$p < .05$

Interaction between Country and Sex on the Verbaliser/Imager Dimension

From Table 2, it can be seen that the interaction between the variables of Country and Sex on the Verbaliser/Imager dimension was significant at the $p < .05$ level, with $\square^2 = .07$, indicating that 7% of the variance is accounted for by the interaction of these two variables. Means for male and female, overseas and Australian students on the Riding Verbaliser/Imager dimension are shown in Figure 1. While there was little difference between the means of overseas and Australian females, the males varied significantly with overseas males having a higher mean than Australian males, placing overseas males more toward the Imager end of the dimension.

A Hiloglinear analysis on the variables of Sex, Country and the categories for the Riding Verbaliser/Imager dimension confirmed the finding from the Analysis of Variance using the ratios on the Riding Verbaliser/Imager dimension that overseas males fell more to the Imager end of the dimension.

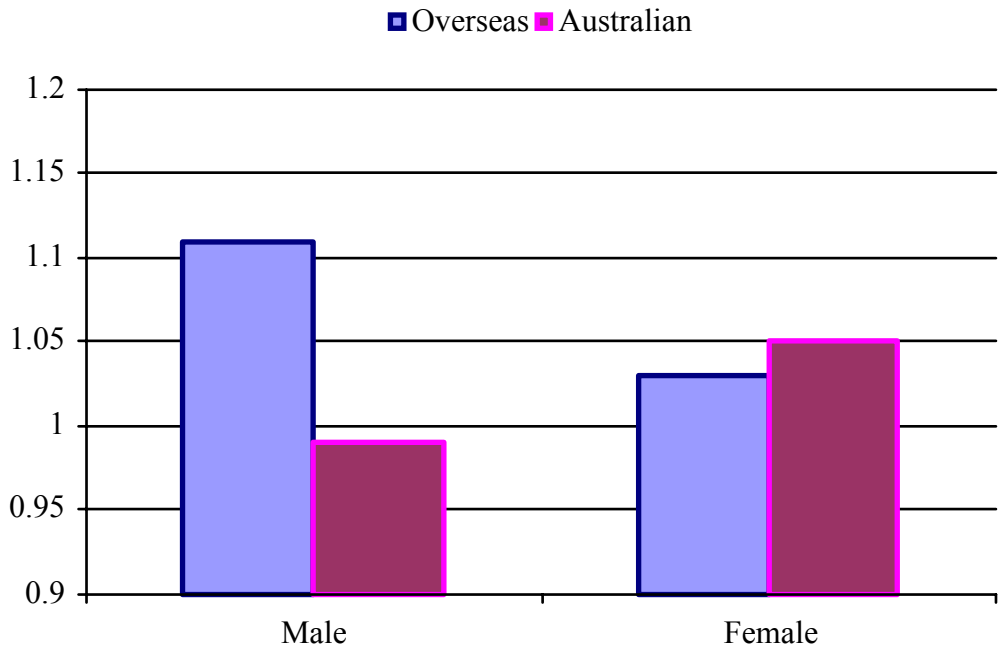

Figure 1. **Means for male and female, overseas and Australian students on the Riding Verbaliser/Imager dimension**.

An exploratory analysis was made comparing the CSA scores on both dimensions of the cognitive styles for students, grouping them according to whether they first learned to read in a character-based language, e.g. Chinese or Japanese, or whether their first language of reading was an alphabet-based language. The statistics for these groups are shown in Table 3. A significant difference was found between the means for the students who learned a character-based language and student who learned an alphabet-based language (df = 85, t = 2.00, P < .05) on the Verbaliser/Imager dimension. Students who first learned a character-based language had a higher mean indicating that they fell more to the Imager end of the dimension. A t-test was also conducted to compare the means of these groups on the Wholist/Analytic dimension. Although the mean for the character-based language group was higher, more to the Analytic end of the dimension, no significant difference was found. Chi square analyses were conducted on the frequencies of the categories for each of the language groups on each of the dimensions. No significant differences were found.

Table 3
Means and Standard Deviations on Both Cognitive Style Dimensions for Students from a Character-Based Language Background and Students from an Alphabet-Based Language Background

	Verbaliser/Imager		Wholist/Analytic	
Language first learnt by students	*M*	*SD*	*M*	*SD*
Character-based language (n = 16)	1.10	0.13	1.28	0.33
Alphabet-based language (n=71)	1.03	0.13	1.22	0.38

The distribution by gender of the overseas students who first learned to read in a character-based language and those whose first language is alphabet-based was also considered. This distribution is shown in Table 4.

Table 4
Distribution by Sex of Overseas Students from a Character-based Language Background and Students from an Alphabet-based Language Background

Language first learnt by students	Male	Female	Total
Character-based	11	5	16
Alphabet-based	16	12	28
Total	27	17	44

The overseas males were fairly evenly divided in the language in which they were first taught to read. Eleven (40.7%) first read in a character-based language and 16 (59.3%) first used an alphabet-based language. There was a less even spread for the overseas females. Only five (29.4%) first used a character-based language while 12 (70.6%) started to read in an alphabet-based language. Thus a greater proportion of males included in the study had first read in a character-based language.

When the South-East Asian students were considered on their own, there was no significant difference between those who first read in a character-based language and those who first used an alphabet-based language. The means and standard deviations of the scores of these groups on the two Riding dimensions are shown in Table 5.

Table 5
Means and Standard Deviations of Overseas Students from character-based and alphabet-based language backgrounds on both of Riding's cognitive style dimensions

	Verbaliser/Imager		Wholist/Analytic	
Language first learnt by students	*M*	*SD*	*M*	*SD*
Character-based language(n = 16)	1.10	0.13	1.28	0.33
Alphabet-based language (n= 28)	1.06	0.14	1.27	0.43

Discussion

Sex, Country and Cognitive Style

Riding and Rayner (1998) state that no gender differences appear to exist with respect to cognitive style and Riding believes that his measure of cognitive style is "culture free" (Riding, 2000a). The lack of difference generally between males and females is supported by this study for both the cognitive style dimensions. The notion of a measure of cognitive style that is unaffected by an individual's culture is more complex. It is closely interwoven with the concept of independence between an individual's cultural background and their cognitive style preferences. The concept "culture free" can refer to two things. At a specific level, it can mean that the instrument measuring the cognitive style does not contain any cultural bias. This study supported the concept that Riding's Cognitive Styles Analysis (CSA) shows no cultural bias. At a general level, it refers to the possibility of people from different cultures having the same range of cognitive style preferences.

Wholist/Analytic Dimension

For the Wholist/Analytic dimension, this study supports both notions of the "culture free" nature of cognitive style. These results match well with Riding's claim that use of response times as the basic unit of measurement and their ratios as the final measure eliminates the variations caused by aspects of culture such as reading ability and general vocabulary because variations in the response times due to these cultural variables would be spread over items from both ends of the dimension.

Verbaliser/Imager Dimension

If this elimination of the cultural bias in the measuring instrument is true for the Wholist/Analytic dimension, it will also be true for the Verbaliser/Imager dimension. The variation that has been identified for individuals from different cultural backgrounds on the Verbaliser/Imager dimension must then be a variation due to their actual positions on the dimension rather than due to the measurement instrument. Why then do the Australian students fall more toward the Verbaliser end of the dimension and the South-East Asian students fall more toward the Imager end of the dimension?

Non-homogenous Groups

It must also be noted that neither of these two groups can be considered as homogeneous. The people of Australia are a mixture of people from many cultures. While nearly all the students from South-East Asia were ethnic Chinese, the degree to which they had inherited

the Confucian heritage and their knowledge of a Chinese language may have differed considerably. For example, ethnic Chinese educated in Indonesia have been prevented from acquiring both Chinese culture and language due to the political nature of the country. However, evidence is available that students from many South-East Asian countries, including Singapore, Hong Kong, and Taiwan, do hold strong Confucian values (Cheung et al., 1992; Lau, 1992; Wu, 1996). It has also been suggested that individuals with a Confucian-heritage background are more Wholist in their approach than Westerners (Yang, 1987). This suggestion has not been supported by this study when the analysis was conducted using country of origin as the defining variable.

First Language

Language is a very important element of culture and one that could have a bearing on whether an individual preferred to code information in pictorial or verbal/symbolic form. While most languages are alphabet-based, some languages, in particular Chinese and Japanese, are character-based. Learning to read a character-based language requires different skills from learning to read an alphabet-based language. The characters are pictorial rather symbolic in nature and they require considerable attention to detail as the differences between characters often depend on a few small details. Biggs (1996) in describing the repetitive nature of learning these characters discusses how the shape of the character is learnt first before a meaning is associated with it. The work of Chen (1996) and Hoosain (1987, 1991) points to individuals who first learn to read in a character-based language being Wholist and Imager in their cognitive style.

In this study, analyses were therefore conducted by dividing the group of students according to the language in which they had first learned to read. Those who learned to read in a character-based language fell significantly more toward the Imager end of the dimension in accordance with the skills they had acquired and used in learning to read. Although the result was not significant, the students who learned to read in a character-based language also fell more toward the Analytic end of the Wholist/Analytic dimension. This trend again matched with skills they would have acquired while learning to read. These results do support the statement by Yang (Yang, 1987) that Chinese people see things "in wholes rather than in parts" and also the considerable number of studies that link reading in a character-based language with a more Verbaliser cognitive style (Chen, 1996; Freeman & Habermann, 1996; Hoosain, 1987, 1991).

The number of participants who had learned to read in a character-based language was small, only sixteen of the 87 subjects, and therefore these results must be treated with caution. This does, however, suggest the need for further research in this area. Not only would such research throw further light on any cultural links with cognitive style, it could also help to determine how cognitive style is acquired – whether it is innate or developed early in life. The tendency of students with a character-based background to fall more toward the Imager end of Verbaliser/Image dimensions could be interpreted as indicating that cognitive style is learned early in life rather than being an innate characteristic.

The influence of learning a character-based language could provide some explanation as to why there was a significant interaction between the gender and country of origin for Verbaliser/Imager dimension. While Australian males displayed a more Verbaliser cognitive style than the females, South-East Asian males fell more to the Imager end of the dimension. Little difference was found between the females from the two country groups. From Table 4, it can be seen that the overseas males were more evenly spread across those who had first learned to read in a character-based language (40.7%) and those who first read in an alphabet-based language (59.3%) than were the overseas females. The females fell more in the alphabet-based language group (70.6%) with only five (29.4%) in the character-based language group. Thus the gender by country of origin interaction could be due to this higher proportion of overseas males with a character-based language background. This in turn lends support to the need for further research into the influence of the type of language in which an individual learns to read, on their cognitive style.

Conclusion

When the country of origin was considered, significant differences were found. Although there were no differences in scores on the Wholist/Analytic dimension of cognitive style, South-East Asian students tended to fall more to the Imager end of the Verbaliser/Imager dimension. This trend was supported by comparing students who had first learnt to read in a character-based language with those who first read in an alphabet-based language. Students with a character-based background were more inclined to be Imager. This finding matches well with other research on Confucian-heritage background students and lends some support to the notion of cognitive style being learnt rather than innate. Further research is required in this area, particularly in relationship to the possible link between the language in which an individual first learns to read and their preferred cognitive style. These individual differences in cognitive style are important in any educational situation but particularly so when students from mixed cultural backgrounds are being taught.

References

Biggs, J. (1996). Western Misperceptions of the Confucian-Heritage Learning Culture. In D. Watkins & J. Biggs (Eds.), *The Chinese Learner: Cultural, Psychological and Contextual Influence.* Melbourne: ACER.

Biggs, J., & Watkins, D. (1996). The Chinese Learner Retrospect. In D. Watkins & J. Biggs (Eds.), *The Chinese Learner: Cultural, Psychological, and Contextual Influences*. Melbourne: ACER.

Borg, M.G., & Riding, R.J. (1993). Teacher stress and cognitive style. *British Journal of Educational Psychology*, 63, 271 – 286.

Chen, H.-C. (1996). Chinese Reading and Comprehension: A Cognitive Psychology Perspective. In M.H. Bond (Ed.), *The Handbook of Chinese Psychology*. New York: Oxford University Press.

Cheung, P.C., Conger, A.J., Hau, K.-T., Lew, W.J.F., & Lau, S. (1992). Development of the Multi-Trait Personality Inventory (MTPI): Comparison Among Four Chinese Populations. *Journal of Personality Assessment*, 59(3), 528 – 551.

Entwistle, N. (1988). Motivational Factors in Approaches to Learning. In R.R. Schmeck (Ed.), *Learning Strategies and Learning Styles*. New York: Plenum Press.

Freeman, N.H., & Habermann, G.M. (1996). Linguistic Socialization: A Chinese Perspective. In M.H. Bond (Ed.), *The Handbook of Chinese Psychology*. New York: Oxford University Press.

Hoosain, R. (1987). Perceptual Processes of the Chinese. In M.H. Bond (Ed.), *The Handbook of Chinese Psychology*. New York: Oxford University Press.

Hoosain, R. (1991). *Psycholinguistic Implications for Linquistic Relativity: A Case Study of Chinese.* Hillside, New Jersey: Lawrence Erlbaum Associates.

Kolb, D.A., Boyatzis, R.E., & Mainemelis, C. (2001). Experiential Learning: Previous Research and New Directions. In R.J. Sternberg & L. F. Zhang (Eds.) *Perspectives on Thinking, Learning, and Cognitive Styles*. Mahwah, NJ: Lawrence Erlbaum Associates.

Lau, S. (1992). Collectivism's Individualism: Value Preference, Personal Control, and the Desire for Freedom among Chinese in Mainland China, Hong Kong, and Singapore. *Personality and Individual Differences*, 13(3), 361 – 366.

Marton, F., & Saljo, R. (1976). On Qualitative Differences in Learning:1 – Outcome and Process. *British Journal of Educational Psychology*, 46, 4 – 11.

Marton, F., Dall'Alba, G., & Tse, L.K. (1996) Memorizing and Understanding: The Keys to the Paradox. In D.A. Watkins & J.B. Biggs (eds.), *The Chinese Learner: Cultural and Contextual Influences.* Melbourne: ACER.

Rayner, S. (2000). Reconstructing Style Differences in Thinking and Learning: Profiling Learning Performance. In R. J. Riding & S.G. Rayner (Eds.), *International Perspectives on Individual Differences*. Stamford Connecticut: Ablex Publishing Corporation.

Riding, R.J. (1991). *Cognitive Styles Analysis*. Birmingham: Learning and Training Technology.

Riding, R. J. (2000). Cognitive Style: A Review. In R.J. Riding & S.G. Rayner (Eds.), *International Perspectives on Individual Differences*. Stamford Connecticut: Ablex Publishing Corporation.

Riding, R.J., & Agrell, T. (1997). The Effect of Cognitive Style and Cognitive Skills On School Subject Performance. *Educational Studies*. 23, 311 – 323.

Riding, R.J. & Al-Salih, N. (2000). Cognitive Style and Motor Skill and Sports Performance. *Educational Studies*. 26, 19 – 32.

Riding, R.J., Burton, D., Rees, G. & Sharrat, M. (1995). Cognitive Style and Personality in 12-year-old children. *British Journal of Educational Psychology*. 65, 113 – 124.

Riding, R.J., & Cheema, I. (1991). Cognitive Styles – an overview and integration. *Educational Psychology*, 11, 193 – 215.

Riding, R.J., & Douglas, G. (1993). The effect of cognitive style and mode of presentation on learning performance. *British Journal of Educational Psychology*, 63, 297 – 307.

Riding, R.J., Glass, A., Butler, S.R., & Pleydell-Pearce, C.W. (1997). Cognitive Style and Individual Differences in EEG Alpha during Information Processing. *Educational Psychology*, 17 (1 and 2), 219 – 234.

Riding, R.J., Glass, A., & Douglas, G. (1993). Individual Differences in Thinking: cognitive and neurological perspectives. *Educational Psychology*, 13 (3 and 4), 267 – 279.

Riding R.J., & Rayner, S. (1995). The Information Superhighway and Individualized Learning. *Educational Psychology*, 15, 365 – 378.

Riding, R. J., & Rayner, S. (1998). *Cognitive Styles and Learning Strategies: Understanding Style Differences in Learning and Behaviour*. London: David Fulton Publishers.

Riding, R.J., & Read, G. (1996). Cognitive Style and Pupil Learning Preferences. *Educational Psychology*, 16, 81 – 106.

Riding, R.J., & Watts, M. (1997). The Effect of Cognitive Style of Preferred Format of Instructional Material. *Educational Psychology*, 17, 179 – 183.

Sadler-Smith, E., & Riding, R. (1999). Cognitive Style and Instructional Preferences. *Instructional Science*, 27, 355 – 371.

Sternberg, R. J., & Zhang, L.-F. (2001). *Perspectives on Thinking, Learning, and Cognitive Styles*. Mahwah, NJ: Lawrence Erlbaum associates.

Witkin, H. A., & Goodenough, D. R. (1987). *Cognitive Styles: Essence and Origins, Field Dependence an Field Independence.* New York: International Universities Press.

Wu, D.Y.H. (1996). Chinese Childhood Socialization. In H. Bond (Ed.), *The Handbook of Chinese Psychology*. New York: Oxford University Press.

Yang, K.-S. (1987). Chinese Personality and its Change. In H. Bond (Ed.), *The Psychology of the Chinese People*. New York: Oxford University Press.