

공간 인지의 성별 차이에 대한 이론적 검토와 지리교육적 함의

한국지리환경교육학회지, 제17집, 제 2권, 2009년 8월, 125-143쪽

지리교육과

신정엽

본 연구는 공간 인지의 성별 차이에 대한 기존 연구를 비판적으로 분석하고 이를 바탕으로 지리교육 측면의 함의를 도출하는데 그 목적이 있다. 이를 위해 공간 인지의 성별 차이에 대해 공간 능력, 지도와 관련된 학습, 공간 인지 전략을 중심으로 비판적 논의를 진행하였다. 또한 공간 인지의 성별 차이를 생물학적 요인, 사회적 요인, 방법론적 측면을 중심으로 살펴보았다. 이를 토대로 지리교육의 함의를 6가지, 즉 공간 인지와 관련한 지리교육의 필요성 확인, 공간 인지의 구성 요소에 대한 적절한 정의와 개념화, 공간 인지 지식의 구조화, 지도와 관련된 적절한 공간 인지 학습 요소의 도출, 객관적인 공간 인지 평가 요소와 기준의 설계, 사회적 공평성을 위한 공간 인지에 대한 지향을 중심으로 제시하였다. 공간 인지의 성별 차이에 대한 논의는 개인의 자아실현과 공간 능력의 향상, 그리고 사회적 공평성의 실현의 관점에서 다루어질 필요가 있으며 같은 맥락에서 지리교육 과정의 노력이 요구된다.

【주요어】 공간 인지, 성별 차이, 지리교육, 공간 능력, 지도

The Theoretical Review on the Sex Differences of the Spatial Cognition and its Implications on the Perspective of Geography Education

*Journal of Korean Association of Geographic and
Environmental Education, vol. 17(2), 125-143.*

Jungyeop Shin

The purpose of this research is to analyze the prior research on the sex differences of the spatial cognition critically, and then is to propose the implications in terms of geography education. For it, the critical review on the sex differences of the spatial cognition was implemented focusing on the spatial abilities, the learning related to the map, and the spatial cognition strategy. Also, the factors for the sex differences were reviewed based on the biological, social and methodological perspectives. Based on it, the six implications in geography education were suggested: the identification of necessity of geography education for the spatial cognition, the proper definition and conceptualization of the components for the spatial cognition, the structuration of spatial cognition knowledge, the derivation of the proper learning components related to the map, the design of the objective test components and their criteria for the spatial cognition, and the direction of the spatial cognition for social equity. The sex differences of the spatial cognition is needed to be handled in the points of the self-realization and improvement of spatial abilities, and realization of social equity and in the same context the effort of the geography education curriculum is required.

【Keywords】 spatial cognition, sex difference, geography education, spatial ability,
map

❖ 참고문헌

- 김광순·송언근, 2008, “공간인식력 육성을 위한 교과서 그림지도 내용의 재구성”, 한국지리환경교육학회지, 16(2), 111-128.
- 김민성, 2007, “공간적 사고와 GIS의 교육적 사용에 대한 가능성 탐구”, 한국지리환경교육학회지, 15(3), 233-245.
- 송언근, 2003, “지리하기로서 지리교육의 구성”, 한국지리환경교육학회지, 11(2), 1-16.
- 송언근, 2004, “지리영역에서 바라 본 사회과 교육과정의 반성과 설계”, 한국지리환경교육학회지, 12(2), 229-245.
- 송언근·임진, 2006, “공간인식력 육성을 위한 그림지도 학습의 과정”, 한국지리환경교육학회지, 14(2), 119-134.
- 신정엽·이상일, 2007, GIS의 개념과 원리, 다락방.
- 심승희, 2005, “기능중심의 지도학습 발달: 초등에서의 축척학습을 중심으로”, 한국지리환경교육학회지, 13(2), 263-274.
- 이상일·신정엽·김현미·홍일영·김감영·조대현·전용완·이건학 (역), 2008, 지리정보시스템과 지리정보과학, 시그마프레스.
- 조성욱, 2008, “공간 능력 측정 방법의 한계와 비판적 검토”, 한국지리환경교육학회지, 16(1), 1-15.
- 주지은·노연경·이규민·김아영, 2007, “공간 능력 검사의 성차 및 과제유형 효과와 효율적 측정구조 탐색”, 교육심리연구, 21(2), 311-330.
- 최남수, 1983, “국민학교 아동의 공간개념 형성에 관한 연구”, 지리학과 지리교육, 97-112.
- Apleyard, D., 1970, Styles and methods of structuring a city, Environment and Behavior, 2, 100-117.
- Beaty, W. and Troster, A., 1987, Gender differences in geographical knowledge, Sex Roles, 16, 565-590.
- Benchaim, D., Lappan, G. and Houang, R., 1988, The effect of instruction on spatial visualization skills of middle school boys and girls, American Educational Research Journal, 25, 51-71.
- Blaut, J. M., 1997, Piagetian Pessimism and the mapping abilities of young

- children: a rejoinder to Liben and Downs, *Annals of the Association of American Geographers*, 87(1), 168-177.
- Blough, P. and Slavin, L., 1987, Reaction-time assessments of gender differences in visuospatial performance, *Perceptual and Psychophysics*, 1, 276-281.
- Boer, L., 1991, Mental rotation in perspective problems, *Acta Psychologica*, 76, 1-9.
- Bowers, C. and LaBarba, R., 1988, Sex differences in the laterization of spatial abilities, *Brain and Cognition*, 8, 165-177.
- Cheung, A., 2006, Representational issues in interactive wayfinding systems: navigating the Auckland University Campus, In Carswell, J. and Tezuka, T. (eds.) *W2GIS 2006*, LNCS 4295, 90-101.
- Choi, J., Mckillop, E., Ward, M. and L'Hirondelle, N., 2006, Sex-specific relationships between route-learning strategies and abilities in a large-scale environment, *Environment and Behavior*, 38(6), 791-801.
- Cornell, E. and Heth, D., 2000, Route learning and wayfinding, In Kithin, R. and Friendschuh, S. (eds.) *Cognitive Mapping: Past, Present and Future*, New York: Routledge, 66-83.
- Devlin, A.(eds.), 2001, *Mind and Maze: Spatial Cognition and Environmental Behavior*, London, UK: Praeger .
- Devlin, A. and Bernstein, J., 1995, Interactive wayfinding: use of cues by men and women, *Journal of Environmental Psychology*, 15, 23-38.
- Downs, R., Liben, L. and Daggs, D., 1988, On Education and Geographers: the role of cognitive developmental theory in geographic education, *Annals of the Association of American Geographers*, 78, 680-700.
- Downs, R. and Stea, D. (eds.), 1973, *Image and Environment*, Chicago: Aldine.
- Frank, A., 2000, Geographic Information Science: New methods and technology, *Journal of Geographical Systems*, 2, 99-105.
- Gale, N., Goledge, R., Pellegrino, J. and Doherty, S., 1990, The acquisition and integration of neighborhood route knowledge in an unfamiliar neighborhood, *Journal of Environmental Psychology*, 10, 3-25.
- Galea, L. and Kimura, D., 1993, Sex differences in route-learning, *Personality and Individual Differences*, 14(1), 53-65.

- Garling, T., 1989, The role of cognitive maps in spatial decisions, *Journal of Environmental Psychology*, 9, 269-278.
- Garling, T., Book, A. and Ergezen, N., 1982, Memory for the spatial layout of the everyday physical environment: differential rates of acquisition of different types of information, *Scandinavian Journal of Psychology*, 23, 23-35.
- Gilmartin, P. and Patton, J., 1984, Comparing the sexes on spatial ability: map-use skills, *Annals of the Association of American Geographers*, 74(4), 605-619.
- Goldstein, D., Haldane, D. and Mitchell, C., 1990, Sex differences in visual-spatial ability: the role of performance factors, *Memory and Cognition*, 18, 546-550.
- Golledge, R. G., 1999, *Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes*, Baltimore: Johns Hopkins University Press.
- Golledge, R. and Stimson, R.(eds.), 1997, *Spatial Behavior: A Geographic Perspective*, New York: Guilford Press.
- Golledge, R. Valerie, D. and Scott, B., 1995, Acquiring spatial knowledge: survey versus route-based knowledge in unfamiliar environment, *Annals of the Association of American Geographers*, 85, 134-158.
- Golledge, R. and Ruggles, A., Gale, N. and Pellegrino, R., 1993, Integrating route knowledge in an unfamiliar neighborhood, *Journal of Environmental Psychology*, 13, 293-307.
- Golledge, R. and Spector, A., 1978, Comprehending the urban cognitive environment: theory and practice, *Geographical Analysis*, 10, 403-426.
- Goodchild, B., 1974, Class differences in environmental perception: an exploratory study, *Urban Studies*, 11, 157-169.
- Hanson, S. and Hanson, P., 1980, Gender and urban activity patterns in Uppsala, *Geographical Review*, 70, 291-299.
- Halpern, D., 2000, *Sex Differences in Cognitive Abilities*, 3rd edition, Erlbaum, Hillsdale, NJ: Erlbaum.
- Harper, L. and Sanders, K., 1975, Pre-school children's use of space: sex differences in outdoor play, *Developmental Psychology*, 11, 119-120.

- Hart, R., 1979, *Children's Experience of Place*, New York: Irvington.
- Hart, R. and Moore, G., 1973, *The development of spatial cognition: A review*, In Downs, R. and Stea, D. (eds.) *Image and Environment*, London: Arnold, 246-288.
- Herman, J., Heins, J. and Cohen, D., 1987, *Children's spatial knowledge of their neighborhood environment*, *Journal of Applied Developmental Psychology*, 8, 1-15.
- Kimura, D., 1992, *Sex differences in the Brain*, *Scientific American*, September, 119-125.
- Kirasic, K., Allen, G. and Haggerty, D., 1992, *Agerelated differences in adults macrospatial cognitive processes*, *Experimental Ageing Research*, 18, 33-39.
- Kirasic, K., Allen, G. and Siegel, A., 1984, *Expression of configurational knowledge of large-scale environments: student's performance of cognitive tasks*, *Environment and Behavior*, 16, 687-712.
- Kitchin, R., 1996, *Are there sex differences in geographic knowledge and understanding?*, *The Geographical Journal*, 162(3), 273-286.
- Kozlowski, L. and Bryant, K., 1977, *Sense of direction, spatial orientation, and cognitive maps*, *Journal of Experimental Psychology: Human perception and performance*, 3, 590-598.
- Kuipers, B., 1982, *The 'Map in the Head' Metaphor*, *Environment and Behaviour*, 14, 202-220.
- Law, D. J., Pellegrino, J. W. and Hunt, E. B., 1993, *Comparing the tortoise and the Hare: Gender differences and experience in dynamic spatial reasoning tasks*, *Psychological Science*, 4, 35-40.
- Lawton, C., 1994, *Gender differences in way-finding strategies: relationships to spatial ability and spatial anxiety*, *Sex Roles*, 30, 765-779.
- Lawton, C., Charleston, S. and Zieles, A., 1996, *Individual- and gender-related differences in indoor wayfinding*, *Environment and Behavior*, 28, 204-219.
- Liben, L., 1981, *Spatial representation and behavior: multiple perspectives*, In Liben, L., Patterson, A. and Newcombe, N. (eds.) *Spatial Representation and Behavior Across the Lifespan*, New York: Academic Press, 3-32.

- Linn, M. C. and Petersen, A. C., 1985, Emergence and characterization of sex differences in spatial ability: a meta-analysis, *Child Development*, 56, 1479-1498.
- Lloyd, R., 1989, Cognitive maps: encoding and decoding information, *Annals of the Association of American Geographers*, 79, 101-124.
- Madden, J. and White, M., 1980, Spatial implications of increases in the female labour force: a theoretical and empirical synthesis, *Land Economics*, 56, 432-446.
- Mark, D., Freksa, C., Hirtle, S., Lloyd, R. and Tversky, B., 1999, Cognitive models of geographical space, *International Journal of Geographical Information Science*, 13(8), 747-774.
- Matthews, M., 1987, Gender, home range and environmental cognition, *Transactions of the Institute of British Geographers*, 12(1), 43-56.
- Matthews, M., 1984, Cognitive mapping ability of young boys and girls, *Geography*, 69, 327-336.
- McGee, M., 1982, Spatial abilities: the influence of genetic factors, In Potegal, M., (eds.) *Spatial Abilities: Development and Physiological Foundations*, New York: Academic Press, 199-222.
- McGee, M., 1979, Human spatial abilities: psychometric studies and environmental, Genetic, hormonal, and neurological influences, *Psychological Bulletin*, 86, 889-918.
- McGuinness, D. and Sparks, J., 1983, Cognitive style and cognitive maps: sex differences in representations of a familiar terrain, *Journal of Mental Imagery*, 7, 91-100.
- McNamara, T., Hardy, J. and Hirtle, S., 1989, Subjective hierarchies in spatial memory, *Journal of Experimental Psychology: learning, memory, and cognition*, 15, 211-227.
- Miller, L. and Santoni, V., 1986, Sex-differences in spatial abilities: strategic and experimental Correlates, *Acta Psychologica*, 62, 225-235.
- Montello, D., Lovelace, K., Golledge, R. and Self, C., 1999, Sex-related differences and similarities in geographic and environmental spatial abilities, *Annals*

- of the Association of American Geographers, 89(3), 515-534.
- National Research Council, 2006, *Learning to Think Spatially*, Washington, DC: National Academies Press.
- Newcombe, N. and Dubas, J., 1992, A Longitudinal study of predictors of spatial ability in Adolescent Females, *Child Development*, 63, 36-46.
- Norman, D., 1988, *The Design of Everyday Things*, New York: Dobleday.
- Nyerges, T., Mark, D., Laurini, R. and Egenhofer, M. (eds.), 1995, *Cognitive Aspects of Human-Computer Interaction for Geographic Information Systems*, London: NATO ASI Series.
- Phelps, E. and Damon, W., 1989, Problem solving with equals: peer collaboration as a context for learning mathematics and spatial concepts, *Journal of Educational Psychology*, 81, 639-646.
- Piaget, J. and Inholder, B., 1956, *The child's conception of space*, New York: W.W. Norton.
- Preston, V., McLafferty, S. and Hamilton, E., 1993, The impact of family status on black, white, and Hispanic women's commuting, *Urban Geography*, 14, 228-250.
- Russel, J. and Ward, L., 1982, Environmental psychology, *Annual Review of Psychology*, 33, 651-688.
- Self, C. and Golledge, R., 1994, Sex-related differences in spatial ability: what every geography educator should know, *Journal of Geography*, 93(5), 234-243.
- Self, C., Gopal, S., Golledge, R. and Fenstermaker, S., 1992, Gender-related differences in spatial abilities, *Progress in Human Geography*, 16, 315-342.
- Serbin, L. and Connor, J., 1979, Sex typing of children's play preferences and patterns of cognitive performance, *Journal of Genetic Psychology*, 134, 315-316.
- Siegel, A. and White, S., 1975, The development of spatial representations of large-scale environments, In Resse, H. (eds) *Advances in Child Development and Behavior*, New York: Academic Press, 10-55.
- Silverman, I. and Eals, M., 1992, Sex differences in spatial ability: evolutionary

- theory and data, In Barkow, J., Cosmides, L., Tooby, J. (eds.) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, New York: Oxford University Press, 533-549.
- Smith, B. and Mark. M., 1999, Geographical categories: an ontological investigation, *International Journal of Geographic Information Science*, 15(7), 591-612.
- Smith, M., Goodchild, M. and Longley, P., 2007, *Geospatial Analysis*, Leicester, UK: Winchelsea Press.
- Spencer, C. and Weetman, M., 1981, The microgenesis of cognitive maps: a longitudinal study of new residents of an urban area, *Transactions, Institute of British Geographers*, 6, 375-384.
- Stumpf, H., 1993, Performance factors and genderrelated differences in spatial ability: another assessment, *Memory and Cognition*, 212, 828-836.
- Tolman, E. C., 1948, Cognitive maps in rats and men, *Psychological Review*, 55, 189-208.
- Van Vliet, W., 1983, Exploring the fourth environment: an examination of the home range of city and suburban teenagers', *Environment and Behavior*, 15, 567-588.
- Voyer, D., Voyer, S. and Bryden, M. P., 1995, Magnitude of sex differences in spatial abilities: a meta-analysis and consideration of critical variables, *Psychological Bulletin*, 117, 250-270.
- Ward, S., Newcombe, N. and Overton, W., 1986, Turn left and the church, or three miles north: a study of direction giving and sex differences, *Environment and Behavior*, 18, 192-213.
- Webley, P., 1981, Sex differences in home range and cognitive maps in eight-year old children, *Journal of Environmental Psychology*, 293-302.
- Webley, P. and Whalley, A., 1987, Sex differences in children's environmental cognition, *Journal of Social Psychology*, 127, 223-225.
- Wills, S. and Schaie, K. 1988, Gender differences in spatial ability in old age: longitudinal and intervention findings, *Sex Roles*, 18, 189-203.
- Zimring, C. M., 1981, Stress and the designed environment, *Journal of Social Issues*, 37, 145-171.