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Teaching Cognitive Skill through Dance: Evidence for Near but Not Far Transfer

MIA KEINÄNEN, LOIS HETLAND, and ELLEN WINNER

Can the study of dance lead to enhanced academic skills? Dance is an art form that makes use of a wide variety of cognitive skills and may call upon many of the intelligences identified by Howard Gardner in his theory of multiple intelligences.¹ Clearly dance involves nonverbal spatial and musical intelligence. Dance also may call upon linguistic intelligence, when students learn the verbal vocabulary of dance or when they discuss and evaluate a dance sequence. Because dancers typically work as a group, a dance program may teach skills in interpersonal intelligence. And because dancers are taught to express their feelings through movement, dance may help people become more aware of themselves and hence may help to develop intrapersonal intelligence. Dance programs may also help children to focus and work hard, and children who engage in dance may actually gain more energy for their academic work. Dance, thus, engages students in many ways, and it is conceivable that because of its multifaceted nature, dance, when well taught, can lead to cognitive outcomes in other areas besides the learning of dance. And indeed, dance educators have sometimes made such a claim.² In what follows, we report the results of two very small meta-analyses testing the claims that dance instruction leads to improvements in reading and improvements in nonverbal reasoning.

General Method

To identify studies on dance and cognitive outcomes, we searched eight electronic data bases, beginning with the year of their inception through 1998: Arts and Humanities Index (1988-1998); Dissertation Abstracts International (1950-1998), Educational Resource Information Clearinghouse (1950-1998); Language Linguistics Behavioral Abstracts (1973-1998); PsychLit/PsychINFO (1984-1998); Medline (1966-1998); Microfilm Publications of Human Movement Studies (1950-1999); and the Social Science Index (1988-1998). The following root search terms were used: dance and instruct or train or educat or cognit or learn or achiev or intell or IQ or measur or outcome or effect or evaluat or health.³ We also checked the bibliographies of

identified articles for other relevant studies, hand-searched 41 journals from 1950-1998 which publish articles in relevant fields (education, developmental psychology, the arts),⁴ and sent requests for unpublished manuscripts to over 200 researchers in the field of arts education. Our search yielded 3714 potentially relevant studies.

Almost all of the studies identified by the electronic search were non-empirical, advocacy articles arguing that dance is an ideal way to teach academic skills. These were eliminated, as were ones in which outcomes were teachers' testimonials about students' academic improvement, correlational studies in which students self-selected to study dance, and studies whose outcomes were affective (e.g., self-esteem) or physiological (e.g., balance). We included only experimental studies of dance or movement education that examined nondance, cognitive outcomes, and only studies with control groups and quantified outcomes. Only studies of nonimpaired populations were included.

Our search and inclusion criteria yielded four studies assessing the effect of dance on reading, and three assessing the effect of dance on nonverbal reasoning (from which four effect sizes were derived).⁵ Each study was then coded by the first author and a second coder. The coders disagreed on 12 of 100 coding decisions (a 12% rate of disagreement), and in all cases the disagreement was unambiguously resolved by rechecking the relevant study. Studies were coded according to the categories listed below.

Year of Publication/Outlet. Studies were coded for their year of publication, as well as for their publication outlet (e.g., journal, dissertation, etc.).

Outcome. The type of nondance outcome assessed was recorded as either reading or some form of nonverbal reasoning/intelligence.

Sample size. The total number of subjects in each study was recorded.

Design. The research design of each study was recorded. Studies were coded as true-experimental if subjects were randomly assigned to treatment vs. control group at the individual level, and as quasi-experimental if subjects were assigned to groups at the classroom level. In addition, studies were coded as matched if pretest differences between the control and treatment groups were statistically controlled or if groups were matched in terms of background variables such as SES.

Dance Instruction. Studies were coded for type of dance instruction. Three different types of instruction were identified: *Instrumental dance* instruction was one in which dance instruction was specifically tailored to the goal of teaching a particular nondance skill and in which the desired nondance outcome was taught along with dance. For example, in the Whirlwind program designed to teach reading through dance, dance instruction involved students making their bodies into the shapes of letters of the alphabet; children were then tested on reading decoding skills.⁶ In another study testing the effect of dance on reading, the children repeated the pronunciation of letters after the teacher and then moved with a quality linked to that

letter (e.g., when learning about the letter “w,” children made wave-like movements); children were then tested on word analysis skills.⁷ And in a third study assessing the effect of dance on reading, the creative dance experiences were designed to contribute to school readiness.⁸ The investigator tailored the dance instruction to the six subtests of the Metropolitan Reading Test, which constituted the outcome measured. Thus, in a dance lesson that focussed on letter recognition (one of the subtests), each corner of the room was given a letter name, and children danced to the corners that the teacher called out. And in a lesson focussing on rhyming (another subtest), children danced to a story with rhyming in it. *Creative dance* instruction was one in which students were given challenging, open-ended dance problems to solve. For example, in one study students were asked to explore all different possibilities of supporting their bodyweight using various body parts such as back, abdomen, and lower leg.⁹ In another study the students were asked to dance with the top half of their bodies and keep their legs frozen, and vice versa.¹⁰ *Traditional dance* instruction was one in which students were taken through a structured dance class and were introduced to basic techniques.

Control Instruction. The type of instruction the control group received was recorded.

Duration. Studies in which the dance instruction lasted at least three months were coded as long in treatment (though three months is in actuality not long at all; thus this is a relative judgment); studies in which the instruction lasted between six to ten weeks were coded as medium in length of treatment; and studies in which instruction lasted for less than six weeks were coded as short in duration.

Intensity. Studies in which instruction occurred at least twice a week for a minimum of a half hour a session were coded as relatively high in intensity; all others were coded as low in intensity. Again, twice a week is not particularly intense; this is a relative judgment.

Age. Age of participants was recorded.

Participant Characteristics. Characteristics of participants were recorded. SES was recorded as average unless the study specified some other level. Any other distinguishing characteristics such as special needs or high intelligence were also recorded.

For each study, an effect size was calculated based on one of the methods listed in Table 3 of Winner and Cooper (this issue).

Can Dance Instruction Improve Reading?

Our first meta-analysis was performed on the four studies whose outcomes were verbal measures assessing reading abilities. The study characteristics are summarized below and in Table 1. Full references to these studies can be found in the list of studies at the conclusion of this report.

Year of Publication/Outlet. Studies appeared between the years of 1980 to 1999. Three studies appeared as unpublished doctoral dissertations, and one was an unpublished technical report.

Sample size. The total sample size of the studies analyzed was $n = 527$. Sample sizes ranged from $n = 35$ to $n = 281$, with a mean sample size of $n = 132$ and a median of $n = 106$.

Design. Two studies were quasi-experimental and two studies were true-experimental in design.

Dance/Control Instruction. Three studies used instrumental dance instruction. In one of these studies, the effectiveness of the dance instruction was compared to that of an unstructured reading program (Rose). In a second, the dance instruction was compared to a videotaped lecture and worksheet about word analysis concepts (Heausler). And in a third, the dance instruction was compared to play activities such as artwork and block play (Twillie). One study used traditional dance instruction and compared students given this kind of instruction to students who were simply given their regular curriculum (Seham).

Participant Characteristics. Two studies assessed low SES students, and two assessed average SES students.

Age. All studies assessed children at the elementary school level, ages 5-12.

Results

A mean effect size of $r = .10$ was found; when weighted by size of study, the mean effect size was $r = .21$, indicating that larger samples produced larger effects. However, effect sizes ranged from $r = -0.13$ to $r = 0.34$, yielding a standard deviation of $.20$, equivalent in size to the effect itself. We combined the significance tests from our studies to yield a Stouffer's $Z = 3.36$, $p < .001$. The fact that this test is significant means that we can safely generalize these results to other individuals who might have been selected to participate in these studies. However, the more conservative test of significance, the t -test of the mean Zr , yielded a nonsignificant value of $t = 1.03$, $p = .38$. This indicates that we cannot reliably generalize these results to a new set of similar studies. The case for dance influencing reading achievement is further weakened in three ways. First, the 95% confidence interval for the effect size rs spanned zero (-0.21 to 0.42), indicating that a sample of similar studies might well have an average effect of zero or less. Second, a file drawer analysis indicated that we would need 13 more studies averaging null results (mean probability levels of $.50$), in order to bring the probability level of the Stouffer's Z down to the barely significant level of $p = .05$. Finally, the chi-square test of the standard deviation ($\chi^2 = 13.31$, $df = 3$, $p = .004$) reveals significant heterogeneity among the effects, which suggests that the studies are not a sample drawn from a single group of like studies.

Table 1: Studies Included in the Reading Meta-analysis

Study/Yr./ Outlet	<i>r</i>	<i>Z</i> (<i>p</i>)	<i>N</i>	Design	Dance Instru- tion	Duration	Intensity	Control Instruction	Participant Character- istics	Age	Outcome	Blind /Not Blind	Effect Size Method
READING STUDIES													
Heausler (1987) Doctoral Dissertation	0.03	0.38 (<i>p</i> =.35)	132	True Experi- mental	Instru- mental	Medium	High	Video-taped Lecture	Average SES	Kindergarten and 2nd	Iowa Test of Basic Skills; Word Analysis	No	Δ - method convert- ed to <i>r</i>
Rose (1999) Technical Report	0.34	5.64 (<i>p</i> <.0001)	281	Quasi Experi- mental	Instru- mental	Medium	High	Traditional unstructured reading program	Low SES	1 st grade	Phono-Graphix Test	No	<i>F</i> - method
Seham (1997) Doctoral Dissertation	0.16	1.45 (<i>p</i> =.07)	79	Quasi Experi- mental	Standard	Long	Low	No treatment- Regular school	Low SES	4 th and 5 th graders	Reading Total from Standardized Achievement Tests	Yes	<i>F</i> - method
Twillie (1980) Doctoral Dissertation	-0.13	-.76 (<i>p</i> =.22) (<i>Z</i> in opposite of predicted direction)	35	True Experi- mental	Instru- mental	Medium	High	Regular kindergarten play activities	Average SES	Kindergarten	Metropolitan Readiness Test, Level I - Form P	No	<i>F</i> - method

Discussion

The results of this small meta-analysis are equivocal and do not support a conclusion that dance instruction serves as an effective means of teaching reading. While our combined studies revealed a significant relationship between dance instruction and reading achievement that would likely have been found again had other subjects been selected for these studies, we cannot generalize this result to new studies. These conclusions are further limited by the very small number of relevant studies found.

Let us consider the three instrumental dance studies. Only one of these yielded positive results, the study by Rose. This study assessed the effects of instrumental dance (dance tailored to teach reading) compared to an unstructured reading program. This program proved effective in teaching letter recognition. Should we conclude that this study demonstrated that the skills learned in dance transfer to the act of reading? It is important to note that the program assessed by this study tailored the dance instruction explicitly to teach children to grasp sound-symbol relationships and hence may have compromised the quality of dance instruction. Children were asked to visualize the appropriate symbols for various sounds in the English language and use their bodies to represent the letters of the alphabet. Thus, dance was used as a vehicle for teaching letter recognition, and the dance instruction included explicit teaching of the desired reading outcome. The outcome measured was the Phono-Graphix test, which assesses progress in the areas of Code Knowledge (alphabet sounds), Phoneme Segmentation (separating letter sounds within words), and Nonsense Word Decoding (pronouncing unfamiliar whole words). The control group participated in a reading program that the report did not clearly describe. Thus it is possible that the dance group received reading instruction more directly tailored to the tested outcomes than did the control group.

A second problem with the Whirlwind program was that the teachers of the dance group were aware of the hypothesis that dance should improve reading. Thus these teachers may have taught reading in a more enthusiastic and engaging manner than those teaching the control group. This program was thus vulnerable to teacher expectancy effects, as in fact were both of the other instrumental dance studies, as well.

The two other studies that tailored the dance instruction to reading outcomes did not yield positive effects. It is important to note that in such studies, in which the comparison is between a dance-reading integrated curriculum and a traditional reading program, a lack of effect does not mean that the dance curriculum does not boost reading. Rather, it means only that the dance curriculum does not succeed in boosting reading more than does the traditional reading curriculum. Thus, such comparisons put dance to a stringent test.¹¹

The fourth study assessed standard dance instruction and yielded a positive effect (the study by Seham). Seham evaluated the effects of participation

in a dance program of Jacques D'Amboise's National Dance Institute.¹² The dance instruction in this study involved no reading instruction: dance was taught as a separate discipline. The program is designed for students to "reach their maximum potential through repetition and increasing complexity of steps and ideas."¹³ This is a widely acclaimed dance program that is most likely extremely engaging and stimulating for children. Seham's research demonstrated that children in this program improved on reading as well as other cognitive tests significantly ($p < .05$) more than did a control group that received no special program of any kind.

How can we account for Seham's positive findings? Did the dance instruction teach cognitive skills that then transferred to performance on a reading achievement test? Did the dance instruction lead to greater attention, focus, or energy, which then led to improved academic performance? Since the children in the dance group received a new and exciting program of instruction, while the control group received nothing at all, it is possible that those in the dance group became energized or motivated, and as a result achieved higher reading test scores. A strong piece of evidence in favor of this general motivational explanation is that the children in the dance program showed improved outcomes on *all* of the verbal and quantitative subtests of a standardized achievement test compared to the control group (in this analysis we examined only reading outcomes). Ideally this study should have compared the children in the dance group to children in another kind of exciting new program (e.g., integrating computers or community service into the curriculum), in order to disentangle the possible motivational effects of dance from those of participation in any kind of new program.

Can Dance Instruction Improve Nonverbal Reasoning?

A second meta-analysis was performed on three studies whose outcomes were classified as nonverbal ability measures.¹⁴ We calculated four effect sizes from these three studies, because one tested two different populations—young children and senior citizens. These studies assessed the effect of dance instruction on nonverbal, performance IQ scales and on nonverbal paper and pencil spatial reasoning tests. Table 2 summarizes the characteristics of these studies. Full references can be found in the list of studies at the conclusion of this report.

Year of Publication/Outlet. Studies appeared between the years of 1974-1999. Three studies appeared as unpublished doctoral dissertations, and one was an unpublished technical report.

Sample Size. The total sample size of the studies analyzed was $n=188$. Sample sizes ranged from $n=16$ to $n=78$, with a mean sample size of $n=47$ and a median of $n=47$.

Design. Three studies were quasi-experimental and one was true-experimental in design.

Table 2: Studies Included in Nonverbal Meta-analysis

Study/Yr./ Outlet	<i>r</i>	<i>Z</i> (<i>p</i>)	<i>N</i>	Design	Dance Instruc- tion	Duration	Intensity	Control Instruction	Participant Character- istics	Age	Outcome	Blind /Not Blind	Effect Size Method
Bilsky-Cohen & Melnik (1974) Technical Method Report	0.07	.55 (<i>p</i> =.29)	62	True Experi- mental	Instru- mental	Long	High	Free and non-directed motor activity	Low SES	5-6 years	Discrimination of Forms, Discrimination of Direction, Series Test, Spatial Relationships	Yes	Signifi- cance Test
Kim (1998) Doctoral Dissertation	0.20	1.78 (<i>p</i> =.04)	78	Quasi Experi- mental	Creative	Medium	High	Standard dance program	Average SES	12-13 years	Raven's Standard Progressive Matrices	No	<i>F</i> - method
Von Rossberg- Gempton (1998) Doctoral Dissertation	0.12	.47 (<i>p</i> =.32)	16	Quasi Experi- mental	Creative	Long	High	Traditional exercise program	Average SES	Seniors, 56-103 years	WAIS-R Performance Scale	No	<i>F</i> - method
Von Rossberg- Gempton (1998) Doctoral Dissertation	0.29	1.63 (<i>p</i> =.05)	32	Quasi Experi- mental	Creative	Long	High	Traditional exercise program	Average SES	7-10 years	WISC-R Performance Scale	No	<i>F</i> - method

Dance/Control Instruction. One study compared instrumental dance instruction to free motor activity. One compared creative dance to standard dance. And two compared creative dance to a traditional exercise program.

Participant Characteristics. In one of the studies the participants were low SES, and in three they were of average SES.

Age. One study assessed 5-6-year-olds; one assessed 12-13-year-olds; and one assessed 7-10-year-olds and senior citizens, 56-103 years of age.

Results

We found mean unweighted and weighted effect sizes of $r=0.17$. Combining the Z s from the studies yielded a Stouffer's $Z=2.22$, $p=.01$, indicating that we can generalize these results to other subjects who might have been selected for these studies. The more conservative t -test of the mean Zr yielded a value of 3.46, which is significant, $p=.04$. This indicates that we can generalize our results to new studies on this research question. In addition, the 95% confidence interval did not span zero ($r = .06$ to $r = .29$), showing that the mean effect size of another sample of similar studies would be likely to be positive and to fall within this range. However, a file drawer analysis tells us that we would need to find only three more studies averaging null results (i.e., mean probability levels of .50) in order to bring the probability level of the Stouffer's Z to $p=.05$. Hence the mean effect size is vulnerable to the file drawer effect. However, given that the mean effect size is based on only four effects, this is not surprising.

The effects ranged from $r=.07$ to $r=.29$. The standard deviation of the mean effect size was .10, and this was not significant, as shown by $\chi^2=1.18$, $df=3$, $p=0.76$. Thus, the effect sizes were not significantly heterogeneous which supports a conclusion that the sample represents a group of like studies.

These results allow us to conclude that there is a relationship between the kind of dance instruction in these four studies and the kinds of nonverbal skills assessed. This result can be generalized to new subjects and to new studies on this research question.

Discussion

This analysis suggests that dance instruction does lead to improved visual-spatial skills. However, our conclusions are strongly limited by the fact that our analysis was based on only four studies. In addition, two of these studies are vulnerable to teacher expectancy effects because teachers were not blind to the hypothesis that dance should improve nonverbal skills.¹⁵ It is worthy of note that in the study with the lowest effect size, the teacher was blind to the hypothesis being tested.¹⁶ Of course, being blind to the hypothesis means that one cannot teach for transfer, and thus it is not reasonable to suggest that teachers in such programs should be unaware of the hypothesis that dance training might increase nondance cognitive outcomes.

General Discussion

Can dance instruction teach cognitive skills that can then be deployed in nondance areas? This question has been examined by only a few studies, and the ones examined here examined only two outcomes, reading and nonverbal reasoning. In neither area can we draw any strong conclusions about the power of dance to foster cognitive skills that transfer to other areas. In the case of reading outcomes, we found only four studies, and of these only two showed an effect. In addition, the two demonstrating a positive relationship were not designed to rule out alternative explanations. In one case, reading skills were taught along with the dance instruction; in the other case, a general motivational explanation was not ruled out.

The studies assessing the relationship between dance and nonverbal outcomes provide a stronger test of the hypothesis because these studies did not include instruction in the desired outcome along with the dance instruction. However, these studies also are open to alternative explanations. It is possible that the improved nonverbal test scores are due to the same motivational explanation mentioned above. To rule this out, researchers either need to compare the effects of dance instruction to the effects of some other kind of new and engaging program, or they need to demonstrate that dance instruction transfers to certain predicted nonverbal skills but not to other kinds of skills.

We note that almost all studies included in these two meta-analyses are vulnerable to teacher expectancy effects. In most studies the teachers of the dance group were aware of the hypothesis tested in the studies. Finally, in both meta-analyses, the more rigorously designed the study, the lower the effect size. The most important conclusion that we wish to draw in this article is that the evidence is not yet in on the power of dance to transfer. More research, more rigorously designed and driven by theory about possible transfer mechanisms, is required before we can determine whether dance is an effective way to teach nondance skills, whether dance used in this way is significantly more effective than direct teaching of these nondance skills, and if so, whether such dance programs teach "authentic" dance or rather tailor and constrain dance instruction to fit the desired outcome.

NOTES

1. Howard Gardner, *Frames of Mind: The Theory of Multiple Intelligences* (New York: Basic Books, 1983).
2. For a discussion of how dance calls on a variety of intelligences, see Anne Green Gilbert, "A Conceptual Approach to Studio Dance, Pre K-12," *Journal of Physical Education, Recreation and Dance* (November/December 1992): 43-44. See also Theresa Purcell, "Learning through Language of Dance: A Cross-Curricular Experience," *NASS Bulletin* 78, no. 56 (1994): 20-25. Dance educators who have argued for the transfer effects of dance include J. Allison, "Dancing into Literacy:

- Multitext Inquiry Opens Doors for Urban Students," *Reading and Writing Quarterly: Overcoming Learning Difficulties* 13 (1997): 333-48; Judith Alter, "Arts and Bodies Are Basic: A Manifesto for Creative Dance in the Schools," *Designs for Arts in Education* 85, no. 6 (1984): 26-33; Sherrie Barr and Philip Lewin, "Learning Movement: Integrating Kinesthetic Sense with Cognitive Skills," *Journal of Aesthetic Education* 28 no. 1 (1994): 83-94; Diane Bishop, "Arizona Essential Skills for Performing Arts, K-12" (Arizona Department of Education 1990); Liora Bresler, "Dance Education in Elementary Schools," *Design for Arts in Education* 93, no. 5 (1992):13-20; Geraldine Dimonstein, "A Place of Dance in General Education," *Journal of Aesthetic Education* 19, no. 4 (1985):77-84; Geraldine Dimonstein and Prevots Naima, "Development of a Dance Curriculum for Young Children," (Washington, D.C.: Central Atlantic Regional Lab, June 1969); Judith Lynne Hanna, "Connections: Arts, Academics, and Productive Citizens," *Phi Delta Kappan* (April 1992): 601-7; Judith Lynne Hanna, *Partnering Dance and Education: Intelligent Moves for Changing Times* (Champaign, Ill.: Human Kinetics, 1999); Colla MacDonald, "Creative Dance in Elementary Schools: A Theoretical and Practical Justification," *Canadian Journal of Education* 16, no. 4 (1991):434-41; Yvonne Merseau, Mary Glover, and Meredith Cherland, "Dancing on the Edge," *Language Arts* 66, no. 2 (1989):109-18; Hilary Neeley, "Idaho Dance Project. Creative Movement/Dance: A Model Program for Idaho K-6 Elementary Teachers," (Boise: Idaho State 1994); Bruce Pirie, "Meaning through Motion: Kinesthetic English," *English Journal* (December 1995):46-51; Peggy Schwartz, "Creativity and Dance: Implications for Pedagogy and Policy," *Arts Education Policy Review* 96, no. 1 (1993): 8-16, and Susan Stinson, "Dance Education in Early Childhood," *Design for Arts in Education* 45, no. 1 (1990): 34-41.
3. A dollar sign following each truncated word directed the search to look for all possible words with that beginning.
 4. For a list of journals hand-searched, see Table 1, introductory article of this issue.
 5. One study assessing nonverbal outcomes was potentially relevant but could not be included due to insufficient data: M. Corsi-Cabrera and L. Gutierrez's study "Spatial Ability in Classic Dancers and Their Perceptual Style," *Perceptual and Motor Skills* 72 (1984): 399-402. Three studies were found assessing the effectiveness of using dance to teach scientific concepts. Two of these were eliminated because while the dance group was taught a scientific concept, the control group was taught nothing at all: Carolyn Faye Hoover, "The Effectiveness of a Narrated Pantomime Program in Communicating Selected Health Concepts of Third Graders" (Ph.D. diss., University of Oregon, 1980), and Lorenzo Trujillo, "Enhancement of Self-Concept and Academic Achievement through Ethnic Dance," (Boulder: Center for Bilingual Multicultural Education Research and Service, Colorado University, 1981). A third study with scientific concepts as outcome was eliminated because of insufficient reported data: Frederic Patrizi, "A Classroom Movement Exercise for Teaching Neural Transmission" (Paper presented at the Annual Meeting of the Southwestern Psychological Association, Austin, Texas, 1985).
 6. Dale Rose, "The Impact of Whirlwind Basic Reading through Dance Program on First Grade Students' Basic Reading Skills: Study II" 3-D Group (Chicago, February 1999).
 7. Nancy Heausler, "The Effects of Dance/Movement as Learning Medium on the Acquisition of Selected Word Analysis Concepts and the Development of Creativity of Kindergarten and Second Grade Children" (Ph.D. diss., University of New Orleans, 1981).
 8. Gwendolyn Twillie, "The Effects of Creative Dance on the School Readiness of Five-Year-Old Children" (Ph.D. diss., Texas Women's University, 1980).
 9. Juja Kim, "The Effects of Creative Dance Instruction on Creative and Critical Thinking Skills of Seventh-Grade Female Students in Seoul, Korea" (Ed.D. diss., New York University, 1998).

10. Irene von Rossberg-Gempton, "'Creative Dance': Potentiality for Enhancing Psychomotor, Cognitive, and Social-Affective Functioning in Seniors and Young Children" (Ph.D. diss., Simon Fraser University, 1998).
11. One study, by Twillie, 1980, actually showed a negative effect. The control group outperformed the dance group. The author suggests that this may have occurred because the control group received more of a reading program called "Ready Steps." If this is the case, this study may not have given the dance group a fair chance, since the control group may have been given more instruction in reading.
12. Jenny Seham, "The Effects on At-Risk Children of an In-School Dance Program" (Ph.D. diss., Adelphi University, 1997).
13. *Ibid.*
14. We did not include in the meta-analysis one study that assessed visually impaired subjects, because we included studies only of nonimpaired populations: Donna Lisa Chin, "The Effects of Dance Movement Instruction on Spatial Awareness in Elementary Visually Impaired Students, and Self-Concept in Secondary Visually Impaired Students" (Ph.D. diss., University of Northern Colorado, 1985).
15. Juja Kim, "The Effects of Creative Dance," and Irene von Rossberg-Gempton, "'Creative Dance'"
16. Rachel Bilsky-Cohen and Noah Melnik, "The Use of Creative Movement for Promoting the Development of Concept Formation and Intellectual Ability in Young Culturally Disadvantaged Children. Final report" (Jerusalem, Israel: Hebrew University of Jerusalem, 1974).

Studies Used in Meta-Analyses

- Bilsky-Cohen, Rachel, and Noah Melnik, "The Use of Creative Movement for Promoting the Development Concept Formation and Intellectual Ability in Young Culturally Disadvantaged Children. Final Report" (Jerusalem, Israel: Hebrew University of Jerusalem, 1974).
- Heausler, Nancy L., "The Effects of Dance/Movement as Learning Medium on the Acquisition of Selected Word Analysis Concepts and the Development of Creativity of Kindergarten and Second Grade Children" (Ph.D. diss., University of New Orleans, 1981).
- Kim, Juja, "The Effects of Creative Dance Instruction on Creative and Critical Thinking Skills of Seventh-Grade Female Students in Seoul, Korea" (Ed.D. diss., New York University, 1998).
- Rose, Dale, "The Impact of Whirlwind Basic Reading through Dance Program on First Grade Students' Basic Reading Skills: Study II," 3-D Group (Chicago, February 1999).
- Seham, Jenny, "The Effects on At-Risk Children of an In-School Dance Program" (Ph.D. diss., Adelphi University, 1997).
- Twillie, Gwendolyn Brown, "The Effects of Creative Dance on the School Readiness of Five Year Old Children" (Ph.D. diss., Texas Women's University, 1980).
- Von Rossberg-Gempton, Irene. E. "'Creative Dance': Potentiality for Enhancing Psychomotor, Cognitive, and Social-Affective Functioning in Seniors and Young Children" (Ph.D. diss., Simon Fraser University, 1998).

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