Meta-Analysis of Disability Simulation Research for Elementary Students in Korea

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Abstract

Disability simulation is an educational approach to modify attitudes and behaviors toward persons with disabilities by allowing participants to experience simulated life activities of individuals with disabilities. Despite the controversy regarding the effectiveness of disability simulations and its potential counterproductive effects, however, disability simulations are considered as a common means for improving disability awareness in educational settings. The current research examines the effectiveness of disability simulations for elementary students in Korea by replicating meta-analytic research of Flower et al. (2007). Results show that the overall effect size is .80 which is different from the results of previous meta-analytic research (= .04). This research discusses the difference in results and provides practical advice that complements identified shortcomings of disability simulations.

Keywords: *disability simulation, meta-analysis, elementary student, attitude, behavior*

Introduction

In 2014 the Ministry of Education in Korea reported that more than 70% of students eligible for special education are placed in inclusive classrooms (Ministry of education, 2014). However, students in the inclusive environment do not fully enjoy the benefits of integrated education because students with and without disabilities have not reached socio-emotional integration beyond mere physical integration (Jung, Song, & Lee, 2015). According to the 4th Five-Year Plan for Special Education Development (2013-2017), the Ministry of Education plans to solve this issue through educational programs and campaigns. For example, K-12 schools are required to provide disability awareness education at least twice a year.

Disability simulation is one of the most frequently used programs for disability awareness education (Kim, 2015; Kim, 2014). Disability simulation was developed to modify attitudes and behaviors of participants without disabilities toward persons with disabilities by raising empathy through sensitizing to limitations in everyday life activities (Kiger, 1992). Disabilities are simulated in a way that participants without disabilities experience what it is like to have a disability using devices that restricts the functions of the designated body. In the past disability simulation exercises were usually conducted as a one-time event without structured pre-education or post-discussion about participants' experiences. However, recent disability simulation programs tend to expand to a course of disability awareness programs which include information about disability, direct or indirect contact with individuals with disabilities, and group discussion. According to the 4^{th} Comprehensive Plan of Policy for Persons with Disabilities (2013-2017) in Korea, the Ministry of Health and Welfare plans to increase the number of disability simulation participants up to 18,000 per year by the year 2017 to improve awareness of disabilities.

The effectiveness of disability simulation has been reported in many literature (e.g. Bang & Seo, 2009; Kang, Kim, Kim, Park, & Lee, 2004; Seo & Kim, 2009, Yu & Cho, 2008). Researchers noted that the simulated disability experience helped students without disabilities understand the discomfort and frustration that students with disabilities face. After the disability simulation exercise, students without disabilities were able to share empathy with their peers with disabilities and address societal responsibility for identified problems such as accessibility and equal opportunities (Yu & Cho, 2008). The simulated disability experience has been reported to have a positive correlation with attitudes toward persons with disabilities (Yuker, Block, & Campbell, 1970). These changes in perceptions and attitudes also affected changes in behavioral preferences. Among studies about the effectiveness of disability simulations, studies that used Siperstein's Activity Preference Scale observed positive behavioral changes (Bang & Lim, 2007; Lee & Lee, 2006; Na & Kim, 2004; Ryu & Kim, 2005; Yoon & Choi, 2007). However, there is a study that have found differences in the degree of effectiveness according to age. This comparative study on disability awareness in elementary, middle, and high school students noted that younger children who have attended disability awareness programs including disability simulations showed a higher capacity to accept others with disabilities. The researcher consequently stated that disability awareness programs should begin as early as possible before certain attitudes are formed for children (Kim, 2015).

Disability simulations do not seem to be conducted as a way to impose a certain perspective. Rather, there are scholars who hold a critical view of emphasizing the joy of disability simulations (French, 1992; Herbert, 2000). In that people do not easily alter their attitudes and behaviors under force (Kuno, 2009), it can be educationally meaningful that participants of disability simulation exercises rate their experiences as valuable or satisfactory (e.g. Crotty, Finucane, & Ahern, 2000: Kang, 2015).

At the same time there are critics of disability simulations who doubt the effectiveness of disability simulations. First, disability simulations are criticized for failing to simulate what is really going on with disability. Disability simulations do not provide opportunities to fully experience everyday lives of individuals with disabilities because disability simulations are conducted for a limited time (Kiger, 1992). The simulation participants know that they will return to their ordinary life right after the exercise so they do not have to make an earnest effort to adapt to situations they have never faced. Even for the serious participants, what they can experience is at best the initial stage of disability experience which might be embarrassing and unfamiliar to anyone who has neither developed nor mastered coping skills (Olson, 2014). It is not reasonable to simulate the lives of people with disabilities only in terms of loss of function, ignoring other values of life. Even if the lives of people with disabilities are views only in terms of loss of function, disabilities are not as simple as simulated disabilities. For instance, using wheelchair does not only mean a loss of mobility. Individuals with paraplegia also experience bladder dysfunction and senselessness.

Second, those superficially simulated experiences are strongly oriented to individualized functioning limitations. Many persons with disabilities state that the impairment itself is not a core of disability experience because they can find their own coping strategies with their impairments. What makes people with disabilities disabled is psycho-social difficulties such as unemployment and resulting poverty, restricted participation in the mainstream social life due to prejudice toward people with disabilities (French, 1992). Since disability simulations activities emphasize physical difficulties, disability simulations may lead participants to a conclusion that difficulties people with disabilities experience are due to only intrinsic factors.

Third, some disability simulations knowing that simulated activities cannot provide an accurate experience, focus on emotional aspect of disabilities to develop empathy and positive attitudes (Kiger, 1992; Wurst & Wolford, 1994). However, disability simulations could potentially reinforce negative feelings related to disabilities such as low self-esteem, helplessness, humiliation, feelings of inferiority, sympathy, pity, inconvenience, and loss of control (Woo, 2015). For instance, 8 and 9 years-old students who participated in a disability simulation study reported feelings of unhappy, lonely, upset, and being treated differently (Wood, 1990 cited in French 2016). Such feelings are products of personalized reactions to disabilities which stimulate anxieties about the participants' own vulnerabilities (Siller, Chapman, Ferguson, & Vann, 1967) and an over generalization of a partial experience of being disabled influenced by pervasive negative social perceptions of disability that participants without disabilities have. Those unpleasant feelings may result in perpetuating negative attitudes toward disability rather than improving awareness of disability (Kiger, 1992). Students without disabilities who participated in a disability simulation study agree that students with disabilities have equal rights and opportunities with them. However, students without disabilities present ambivalent feelings of appreciation that they do not have disabilities (Yu & Cho, 2008)

Flower and her colleagues (2007) stated that, in their meta-analytic research of 10 disability simulation studies, disability simulation is not an effective practice. Additionally, researchers pointed out that the effects of disability simulations for children are largely unknown. Despite the controversy regarding the effectiveness of disability simulations and its potential counterproductive effects, however, disability simulations are considered as a common approach for improving disability awareness in educational settings. To investigate the effectiveness of disability simulations for children in educational settings, this study analyze research on disability simulations for elementary students published in Korea by replicating meta-analytic research of Flower et al. (2007). Specifically, this research asks the following questions:

- How effective are disability simulations in changing perception, attitudes, or behaviors of elementary students in Korea?
- Do any negative effects occur among elementary students who participate in disability simulations?

Method

Data Collection

RISS (Research Information Sharing Service), an online search engine developed by Korea Education and Research Information Service (KERIS), was searched on Jan 2017 using the keyword 'disability simulation' in Korean. The search identified 18 studies, the references of which were examined to identify additional sources. Additional 11 studies were identified, resulting in a total of 29. These studies were then subjected to the following criteria for inclusion in the meta-analysis:

- Participants were placed in situations designed to help them experience what it is like to have disabilities in order to change the participants' perceptions, attitudes, and/or behavior.
- Participants' were elementary students.
- The study included at least one between groups (i.e., experimental and control group) comparison or at least one within-group (i.e., pre- and post-test) comparison.
- The study presented quantitative data that could be used to compute effect sizes. Means and standard deviations for both experimental and control groups or for both pre- and post- implementation were necessary. However, the study was also included if enough data were provided to compute the necessary means and standard deviations or if statistical analyses provided enough data to compute an effect size.
- The study was published in a peer-reviewed journal since year 2000.
- The study was written in Korean.

Of the 29 studies identified, eight studies met the aforementioned criteria. Many research on disability simulation which may have meaningful empirical data are excluded due to their subjects are not elementary students. Qualitative studies and quantitative studies which have incomparable data sets are also excluded.

Categorization of Studies

The eight research studies are classified based on disability, simulation format, dependent variable, age, length of time, and study design, the result of which are displayed in Table 1. First, disabilities are categorized based on how authors of each study address in their studies because most updated governmental categories of disability may not properly categorize disabilities addressed in each study which would have followed the past categories. Authors of each study categorize disabilities into physical disability (P), visual impairment (V), hearing impairment (H), communication disorder (C), learning disability (L), developmental disability (D), intellectual disability (I), autism (A), and emotional and behavioral disturbance (EBD). Unlike Flower et al. (2007), except for two studies which addressed a single disability, most studies addressed more than one disability in their simulation research. Since there are no distinct differences between studies, disability is not used as a moderator variable in this research. Second, the formats of study include presenting information, direct or indirect contact with people with disabilities, vicarious experiences, and group discussion. Most studies used combined simulation formats, whereas two studies provided a simulation exercise only. Third, dependent variables are categorized into perception, attitude, and behavior. Perception was not included in the study of Flower et al. (2007). However, two studies which included perception as their dependent variable, conceptualized it as a distinct entity in that the formation of positive attitudes requires a precedent process to correctly perceive disability (Shin, Park, & Kang, 2010).

Fourth, studies included in this research collected data from non-adult subjects. Participants of the studies were all elementary students. Finally, the length of time required to complete the simulation varied. However, most studies devoted more than 400 minutes total because they addressed more than one disability using various educational formats. Some studies stated only the number of activities instead of the length of time required to complete the activity.

Table 1. Characteristics of Studies Included in the Meta-Analysis

Study	ES	n	DC	SF	DV	Age	Duration	Study design
Bang & Lim, 2007	1.06	26	P,V,H,I	Simulation & Group discussion	Attitude	4th	Total 800 min, 40min/each (4 times/week, 20 times)	Within Group
	1.23	26			Behavior	4th		Within Group
Choi & Kim, 2003	.08	26	P,V,H,I	Combined all	Attitude	1st	6 weeks	Within Group
	1.46	26			Attitude	3rd		Within Group
	.82	26			Attitude	5th		Within Group
	.83	26			Behavior	1st		Within Group
	1.72	26			Behavior	3rd		Within Group
	1.00	26			Behavior	5th		Within Group
Chu & Kang, 2009	.55	23/20	P,V,H,I, EBD,A,L	Combined all	Behavior	5th	Total 880 min, 40min/each (2 times/week, 22 times)	Between Groups
	1.11	23			Behavior	5th		Within Group
Kuk & Mun, 2000	.20	230	P,V,H,I,L	Simulation	Attitude	5-6th	Total 800min, 40 min/each (4 times/week, 20 times)	Within Group
	.29	230			Behavior	5-6th		Within Group
Lee & Lee, 2006	.05	26	V	Simulation	Attitude	2nd	Total 800 min, 40min/each (2 times/week, 20 times)	Within Group
	2.51	26			Behavior	2nd		Within Group
Park & Kim, 2008	1.94	28	P,V,HC	Simulation	Perception	3rd	Total 480min, 40min/each (2 times/week, 12 times)	Between Groups
	1.03	28			Attitude	3rd		Between Groups
Shin et al., 2010	.35	40	P,V,H,I	Simulation	Perception	3rd	Total 1200min, 40-80min/each (2-3 times/week, 20 times)	Within Group
	.25	40			Attitude	3rd		Within Group
Yoon & Choi, 2007	.63	31	H	Information & Simulation	Attitude	4th	Total 600 min, 40min/each (2 times/week, 15 times)	Within Group
	.64	31			Attitude	4th		Between Groups
	.62	31			Behavior	4th		Within Group
	.52	31			Behavior	4th		Between Groups

Note. ES = effect size, DC = disability category, SF = simulation format, DV = dependent variable

Effect Size Calculation and Interpretation

Coe (2002) noted, "effect size is simply a way of quantifying the size of the difference between two groups" (para. 1). Effect size of each study is computed using Cohen's *d* which subtracting the mean of the control group from the mean of the treatment group, or the mean of the pretest from the mean of the post-test, and dividing the deference by the pooled standard deviation of the two groups. It should be noted that one study used a measuring tool designed to have participants achieve lower scores when they possess more positive attitudes or behaviors. For the correct interpretation of the study, effect sizes of the study were inverted. According to Cohen (1988), effect sizes are categorized into three groups. Effect size of .20 or lower are interpreted as small, .50 as medium, and .80 or higher as large. The negative effect size means the control group has a better effect. In addition to Cohen's *d*, bias corrected effect sizes (Weighted ES) using Hedges' formula (1982) and 95% confidence intervals are presented in Table 2. For estimating more reliable heterogeneity of weighted effect sizes are also computed. Review Manage 5.3 and Center for Evaluating and Monitoring (CEM) Effect Size Calculator are used for computing the data.

Results

The results of testing heterogeneity of effect sizes indicate the presence of considerable heterogeneity of aggregated effect sizes (=81%). Thus, effect sizes are calculated using the random effects model. In addition, heterogeneity is analyzed by subgrouping moderator variables.

For the first research question, effectiveness of disability simulation, a total of 22 effect sizes are computed from the eight studies, with a median effect size of .73. The weighted *d* for aggregated studies is .80. The range of 22 effect sizes is .05 to 2.51. Three effect sizes are equal or less than .20, another eight are between .20 and .80, and the other 11 are over .80 in magnitude. Table 2 lists the number of computed effect sizes along with median and weighted effect size and the 95% confidence interval for moderator variables. Three of 12 median effect sizes are less than .50, another three are between .50 and .80 and the rest six exceed .80. The weighted unbiased estimates suggest .54 to 1.13 which mean medium to large effects. The 95% confidence interval for weighted effect sizes also indicate that two weighted effect sizes include zero. For the second research question, negative effects of disability simulation are not found. None of the weighted and unweighted effect sizes appear to be negative.

Table 2. Summary of Dependent Variables and Moderator Variables with Median and Weighted Effect Sizes

Variable	n of ES	Median ES	Weighted ES	95% CI	
				Lower	Upper
Desired Change					
Perception	2	1.15	1.11	-.42	2.65
Attitude	10	.64	.58	.30	.86
Behavior	10	.92	.98	.59	1.03
Format of Simulation					
Simulation	6	.32	.58	.24	.91
Simulation & Information	6	.63	.78	.25	1.31
Simulation & Discussion	2	1.15	1.13	.71	1.54
Combination	8	.92	.92	.57	1.27
Age group					
Elementary 1-2	4	.46	.83	-.15	1.81
Elementary 3-4	12	.84	.91	.61	1.20
Elementary 5-6	6	.69	.54	.27	.80
Duration					
Less than 800min	6	1.25	.86	.48	1.23
800min and more	10	.45	.67	.36	.98

Note. ES = effect size, CI = confidence interval

Dependent Variable

The effects of experiments that targeted changes in perception, attitude, and behavior are examined. All median and weighted effect sizes of this section exceed .50. Specifically, effect sizes for perception and behavior indicate large in magnitude. However, the 95% confidence interval for the effect size of perception include zero which means no statistical significance at 5% significance level.

Format of Simulations

All median and weighted effect size estimates for the various formats of disability simulation exceed .50 except for the median effect size of simulation only. Simulation and group discussion has the highest median effect size and a weighted effect size of 1.13. The weighted effect size of combination of various formats such as disseminating information, direct and/or indirect contact with persons with disabilities is also large in magnitude.

Age Group of Participants

Next moderator variable examined the effect sizes for studies among different age groups. The age groups are categorized as shown in Table 2. All median and weighted effect sizes exceed .50 except for the median effect size for the first and second graders. The 95% confidence interval for the effect size of the first and second graders also include zero. The median and weighted effect sizes for three to fourth graders and fifth to sixth graders are large and medium in magnitude.

Duration of Simulation

Most studies reported required time for simulation exercises and frequency. Duration of simulation was converted to total minutes and categorized as shown in Table 2. The reported duration of simulations raged from 480 to 1200 minutes. The median and weighted effect size for less than 800 minutes exceed .80. The weighted effect size for 800 min and more exceed .50 whereas the median effect size is less than .50.

Discussion

This research is conducted to investigate the effects of disability simulation for changing perception, attitude, and behavior of children in Korea replicating the meta-analysis research of Flower et al. (2007). The median and weighted effect sizes for perceptual, attitudinal, and behavioral change are within the medium to large range according to Cohen’s (1988) criteria. As found in Flower et al. (2007), studies that targeted behavior changes appear to have relatively larger effects than perceptions or attitudes. Although the perceptual change leads to largest effects, effect sizes are computed from only two studies. Therefore, the stability of its effect size can be warranted with additional investigation.

The results appear to be different from the results of Flower et al. (2007). Flower and her colleagues concluded that, although the harmful effects were not observed, the disability simulation was not an effective practice either. Authors added that the effects of disability simulations for children seemed larger than those with adult participants, however, it should be noted that the effects for children were questionable due to the small number of studies available. The different results of this research from those of Flower et al. (2007) can be explained with three reasons.

First, the age difference may be a leading factor. The targeted participants of this research are children receiving elementary education. The overall effect size is .80. When the ages are categorized as shown in the table 2, effect sizes of each group ranges medium to large in magnitude. As observed in Flower et al. (2007), the simulation exercises for children brought about larger effects than those for adults. Children are in a growth phase. Considering that children are in the developmental stage of evaluating information, establishing belief system, and practicing actions, what they gain from disability simulation is more like developing attitudes rather than changing attitudes. Worchel and Shebilske (1992) describe that changing attitudes is not only different from developing new attitudes, it is also more difficult because you have to go through one more process to give up an old attitude which is a part of your system.

It should be also noted that the 95% confidence interval for the effect size of the youngest group include zero. Thus, the explanation that the simulation exercises for the younger group are not as effective as those for older children may be possible. Although Piaget explains the cognitive-developmental stage for children from 7 to 11 years old, however, differences within this age group which might help analyze current observations have been largely unknown.
Further research may be needed for this difference.

Second, the formats used in the studies are another factor. Flower and her colleagues (2007) categorized formats into four types, presenting information through videotapes, contact with people with disabilities, vicarious experiences, and combination of those three. Studies in Flower et al. (2007) used only one of the four and none of effect sizes for the simulation format exceeded medium effects (ES=.50). Specifically, studies which used vicarious experience recorded the lowest median effect size. Even in this research, the format of simulation only has the lowest median (ES=.32) and weighted effect size (ES=.58). However, all weighted effect sizes for different formats exceed .50 in this research. Studies included in this research used at least a simulation exercise and used additional formats as needed. For example, studies which used the combination format had an educational plan to help participants a) learn about disabilities through lectures or videos, b) experience simulated disabilities, c) organize feelings and thoughts and learn from others through discussions, and d) misspell the myths and become familiar with people with disabilities through direct and/or indirect contacts. The current data appear to show that the effects of multiple uses of various means are stronger than the use of a single means. Therefore, participants of studies might have had an opportunity to complement the shortcomings of the simulation only format through various approaches.

Third, the duration of simulations for the studies in this research is considerably longer compared to Flower et al. (2007). As described above, studies in this research used a variety of simulation formats so required a longer period to complete the educational plan. Except a study which did not specify exact time required to complete the disability simulation, the mean length was about 800 minutes. Flower and her colleagues (2007) found merely small effects for all different time groups. Specifically, authors noted a smaller effect of longer activities. Even in this research, simulations of less than 800 minutes have larger effect sizes. The cause of this observation is unclear because research results on the relationship between study time and achievement are inconsistent. However, it is worthy to note that there are some studies that found inverse association between study time and grades (e.g. Greenwald & Gillmore, 1997; Olivares, 2002). Since there is a possibility that confounding variables may have affected the inverse relationship in this research, additional research is needed.

Limitations

Somewhat different results of this research may interest readers who found interests in the meta-analytic research of Flower et al. (2007). However, some inherent limitations should be noted. First, there are only small body of literature. Since this research began with the question raised by Flower et al. (2007) about the effects of disability simulations for children, only eight studies that met the aforementioned criteria were found. It was also not easy to obtain the full text of unpublished master's theses. This difficulty has created another potential limitation of publication bias. Publication bias refers to the tendency of "investigators, reviewers, and editors to submit or accept manuscripts for publication based on the direction or strength of the study findings" (Dickersin, 1990, p.1385). Relatively positive results of this research might be influenced by publication bias. Finally, studies included in this research used different interventions, research methods, and measurement tools. Thus, finding heterogeneity between studies may be more natural. However, the considerable heterogeneity of this research may have a potential to affect the incorporation of data to elicit meaningful descriptions.

Recommendations for Practice

In 2013, the average social expenditure for people with disabilities in Organization of Economic Cooperation and Development (OECD) countries is 2.11% of Grand Domestic Product (GDP), 3.5 times higher than Korea's 0.61% (2016 Annual report on disability statistics, 2016). Korean government and society still need to pay more attention to improving disability awareness and the quality of their lives. In this sense, the quantitative expansion of disability awareness education is welcome. However, discussions should be held simultaneously to improve the quality of disability awareness education. Although the results of this meta-analytic research appear to support the effectiveness of disability simulations, it does not mean that information and recommendations suggested from individual studies critical to disability simulations can be ignored. First, many disability awareness education programs are provided as a one-time event. In such cases, a disability simulation exercise is considered an easy choice because it does not seem like you need much educational preparation and you believe that it can also be interesting to people. However, it is unreasonable to think that disability simulations is a panacea for improving disability awareness (Behler, 1993). The results from this research and Flower et al. (2007) also show that a single use of a disability simulation exercise has at most medium effects. Therefore, it is recommended that the disability simulation exercise needs complements to achieve its designated objectives, such as, disseminating information about disabilities and simulations, contacting with persons with disabilities or their family, and/or debriefing experiences with a small group. Throughout these activities, educators can place particular emphasis upon reducing adverse effects of disability simulations and improving cognitive and affective awareness of disability. For example, Behler (1993) recommends to combine disability simulations with a role-playing activity which makes it possible to control the situation and monitor elicited behavior, thereby targeting a particular educational goal. Rather than placing emphasis on disability simulations, educators can consider that disability simulations is accompanied as a part with other cumulative and organized educational efforts to improve awareness of disability (Kiger, 1992: Yoon & Kwon, 2016).

Second, it has been already discussed that disability simulations could potentially reinforce negative feelings. Disability simulation studies which measured changes of attitudes using Disability Factor Scales (Siller et al., 1967) consistently noted that participants did not show statistically significant differences or showed negative results in the factor of distressed identification (Kang et al., 2004; Lee & Hoe, 2012; Yang & Lim, 2004). These results indicate that the participants' negative reactions to disabilities are maintained or reinforced through disability simulations. Scholars suggest several ways to prevent negative emotions. The disability simulation activity should not be mysterious (Kiger, 1992) because no positive insights can be expected from participants whose abilities are deprived for the first time. Thus, it is recommended to structure the disability simulation exercise with pre-education which provides as much information as possible about the objectives of exercise, restricted functioning, possible obstacles participants may face, and coping skills and techniques. In addition, educators must create a safe environment so that participants can freely share each other's thoughts and feelings (Kiger, 1992). During a debriefing session, participants' negative experiences and feelings as well as their cognitive, affective, and moral conflicts can be discussed (Behler, 1993). However, educators should be careful of preventing this session from becoming too depressing. Providing resources and information of available accommodations could prevent them from thinking that lives of people with disabilities are hopeless (Clark, Foos, & Faucher, 1995).

Third, Woo (2015) proposed an alternative form of disability simulation exercise. This alternative format provides a disability simulation by creating a limited environment, unlike existing disability simulations which restrict some body functions. For instance, when you experience visual impairments, the facilitator places you in a dark room without a blindfold, instead of providing a blindfold in ordinary space. The biggest conceptual difference is that the cause of disability is placed in the environment. In this case, instead of focusing on individualized functional limitations, educators can naturally lead discussions to find solutions that change the environment.

Finally, some studies understand the result that participants without disabilities feel lucky not to be disabled is a positive effect of disability simulation (Lee & Lee, 2006; Wurst & Wolford, 1994; Yoon & Choi, 2007). However, educators should be careful of interpreting an appreciation for participants' being able-bodied because their consequently raised self-esteem can be projected negatively toward people with disabilities in the form of pity or inferiority. Since disability simulations are not designed to raise participants' self-esteem about not having a disability, educators need to focus on an educational process to allow participants to experience serious social barriers to disability, critically review their perceptions of disability through internal reflection, and learn how to change these disabling social systems and infrastructures (Kuno, 2009).

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