Twins Have Slightly Higher Self-Concepts Than Singletons in the Elementary School Period: A Study of South Korean Twins and Singletons

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The twin method assumes that the trait under study is similar in twins and singletons so that the results from twin samples can be generalized to the singleton population. The purpose of the present study was to compare self-concept in twins and singletons matched in parental level of education. The 6 cluster scales of the Piers-Harris Children's Self-Concept Scale (P-H) were administered to 630 singleton children and 635 twins aged 7 to 12 years. Model-fitting analyses yielded two conclusions. First, self-concept was generally similar between first- and second-born twins and between monozygotic and dizygotic twins across the 6 cluster scales of the P-H. Second, twins consistently exceeded singletons for all 6 cluster scales of the P-H. However, the effect sizes of differences between twins and singletons were small except for one scale, Physical Appearance and Attributes.

The twin method assumes that twins are representative of the general population. If twins are different in means or variances from the singleton population, the results of twin studies cannot be completely generalized to the population at large. The main purpose of the present study is to compare various dimensions of self-concept in twin and singleton children. Self-concept is broadly defined as a person's perception of him- or herself, and typically makes reference to how one feels about one's worth across the evaluative dimensions such as social, academic, behavioral, and physical domains (Marsh & Hattie, 1996). Self-concept has been shown to be important for the children's adaptive development. For example, it has been reported that low self-concept is related to anxiety and interpersonal problems (Byrne, 2000).

There are several reasons why twins can differ from singletons in various domains of self-concept. First, as compared to singletons, twins are premature, lighter, and shorter at birth (Phillips et al., 2001). Consequently, twins tend to remain shorter and smaller than singletons throughout childhood (Buckler & Green, 2004). These delays in physical growth can lead twins to have lower physical self-concepts than do singletons. Second, twins are disadvantaged in their language and reading development (Rooney et al., 2003; Thorpe et al., 2003), which can result in a lower academic self-concept in twins than in singletons. Third, while some studies have suggested that twins are not different from singletons in the risk for behavioral disturbance (Hay & O'Brien, 1987; Simonoff, 1992; van den Oord et al., 1995), others have shown that as compared to singletons, twins in childhood have slightly increased levels of emotional and behavioral problems (Gau et al., 1992; Rutter & Redshaw, 1991). Finally, family interaction and the life experience of twins are different from those of singletons (Rutter & Redshaw, 1991). Clark and Dickman (1984) demonstrated that mothers of twins tended to show frequent shifts of attention from one child to another, whereas mothers of singletons were more likely to have prolonged uninterrupted interactions with their child. Also, parents, teachers, and friends of twins may compare twins in their physical characteristics, behavior, and abilities, which can impact a twin's self-concept development.

In spite of the significance of the research, empirical studies that examined comparability of self-concept between twins and singletons are lacking. Recently, Pulkkinen et al. (2003) compared a large sample of preadolescent Finnish twins to their singleton classmates in a series of adaptive behaviors. Surprisingly, the authors found that twins exceeded their singleton classmates in adaptive behaviors that measured popularity, leadership, and social interaction with other children. From these results, Pulkkinen et al. (2003) asserted that the twinship might have a positive impact on behavioral

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development during childhood. The unexpected findings from the Pulkkinen et al. (2003) study point a need for more specific examination of the twin–singleton comparison in a broad range of social behaviors. The specific goal of the present study was to investigate differences and/or similarities in various domains of self-concept between elementary school twins and singletons in Seoul, South Korea. As parental socioeconomic status has been shown to be significantly related to children's self-concept (Richman, 1985; Trusty, 1994), we compared the self-concepts of twins and singletons matched to the level of parental education.

Materials and Methods

Sample

The twin sample used in the present study was drawn from monozygotic (MZ) and dizygotic (DZ) twin children participating in the ongoing Seoul Twin Family Study (STFS). The twins in the STFS were ascertained from all private and public schools in Seoul, South Korea. The ascertainment procedure of the twin sample and other details of the STFS are described elsewhere (Hur, 2002). Twins' zygosity in the STFS was determined from the twins' parents' responses to a zygosity questionnaire that included three questions regarding physical similarities and the frequency of confusion of the twins by family members and others. The questionnaire method has been shown to be over 90% accurate in Asian samples when compared to DNA method (Ooki et al., 1993). To lower the rate of misclassification, however, we excluded twin pairs whose zygosity was ambiguous.

The self-concept data analyzed here came from a mail survey that was sent to the elementary school twins in the STFS in 2002. The 2002 mail survey included Piers-Harris Children's Self-Concept Scale (P-H; Piers, 1976) and an introductory letter where the purpose of the study was explained and it was emphasized that twins should not discuss answers with their siblings when they completed the questionnaire.

The overall response rate of the mail survey was approximately 20%. Although we received mail responses from students of all grades (1 to 6), we did not use responses from first graders in the present analyses as the validity of responses of the first graders may not be sufficiently high. The final twin sample used in the present analyses consisted of 295 male twins and 340 female twins which include 198 MZ male (MZM), 223 MZ female (MZF), 46 DZ male (DZM), 65 DZ female (DZF), and 103 opposite-sex DZ twins. Ages of the twins ranged from 7 to 12 years with means of 10.0 years (SD = 1.4 years) for male twins and 9.9 years (SD = 1.4 years) for female twins (Table 1). The higher number of MZ than DZ twins in the present study reflected the twin birth rates in South Korean population in the early 1990s (Hur & Kwon, 2005).

The singleton sample used in the present study included 630 elementary school students (322 males and 308 females) whose ages ranged from 7 to 12 years. The mean age of the singletons was 9.9 years with a standard deviation of 1.4 years both for male and female (Table 1). To obtain singleton participants, we selected two large elementary schools in Seoul, where we randomly chose one class from each grade and explained our study to the students in the class. All of the students in the chosen class completed the self-concept measure under the supervision of teachers.

Measure

The P-H, originally developed by Piers (1976), is a self-report instrument that assesses an evaluation of one's own behavior and attributes. Two bilinguals translated an English version of the items of the P-H into Korean. According to the manual (Piers, 1976), the P-H has six cluster scales developed from factor analyses of the various samples. The six cluster scales of the P-H are Behavior, Intellectual Competence and School Status, Physical Appearance and Attributes, Anxiety, Popularity, and Happiness and Satisfaction. On each scale, higher scores indicate higher and more positive self-concept. For this reason, higher scores on the Anxiety scale represent lower anxiety. The sample items of each of the six cluster scales of the P-H are listed in an earlier publication in this journal (Hur, 2005).

In the present sample the internal consistency reliabilities of the six cluster scales of the P-H as measured by Cronbach's alpha ranged from .73 to .79 for the singleton sample and .72 to .82 for the twin sample. The mean of the six reliabilities was .76 for both samples.

Analytical Procedures

We divided the total sample into male and female. On the basis of each gender group, we performed model-fitting analyses to test whether scores on the six scales of self-concept are comparable between (1) first- and second-born twins within each zygosity group, (2) between MZ and DZ twins, and (3) between twins and singletons. Using Mx (Neale, 1999), we conducted maximum likelihood analysis of raw data. Mx calculates twice the negative log-likelihood ($-2LL$) of the data. To test whether means and variances for the six cluster scales of the P-H are equal between groups, we examined the difference in $-2LL$ between the full model where the means and variances of two groups were set to vary and the constrained model where the means and variances of two groups were set to be equal. The difference in $-2LL$ is chi-square distributed with degrees of freedom equal to the difference in degrees of freedom.

We also computed effect sizes to determine the magnitude of differences between MZ and DZ twins and between singletons and twins. An effect size (d) was defined as the absolute difference between group means divided by a pooled estimate of the standard deviation. According to Cohen (1988), an effect size of .2 represents a small effect, .5 represents a medium effect, and .8 represents a large effect.

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Table 1

Demographic Characteristics of the Twin and Singleton Samples

	Twins							
	Male			Female			Singletons	
Characteristics	MZ	DZ	Total	MZ	DZ	Total	Male	Female
N	198	97	295	223	117	340	322	308
Age (in yrs)								
Children	10.1 (1.4)	9.9 (1.4)	10.0 (1.4)	9.9 (1.4)	10.0 (1.5)	9.9 (1.4)	9.9 (1.4)	9.9 (1.4)
Father	41.8 (4.0)	42.9 (4.2)	41.6 (3.8)	41.0 (3.7)	41.5 (3.5)	41.4 (3.6)	41.6 (4.2)	41.2 (4.0)
Mother	38.6 (3.5)	40.8 (4.1)	38.9 (3.8)	38.3 (4.0)	39.1 (3.1)	39.2 (3.7)	38.9 (4.1)	38.6 (3.8)
Education (in yrs)								
Father	13.5 (2.6)	13.7 (2.6)	13.6 (2.6)	13.8 (2.9)	13.5 (2.9)	13.7 (2.9)	14.8 (2.3)	14.9 (2.3)
Mother	12.6 (2.4)	12.4 (2.4)	12.5 (2.4)	12.8 (2.6)	12.8 (2.3)	12.8 (2.5)	14.2 (2.5)	14.0 (2.4)

Note: Standard deviations are in parenthesis. DZ twins include 103 opposite-sex twins.

Results

Demographic Characteristics

Table 1 presents demographic characteristics of the twin and singleton samples. Using *t* tests, we compared MZ and DZ twins and twins and singletons to examine whether these groups are comparable in terms of parental age and years of education. The *t* tests were carried out separately by gender. In both males and females, there was no significant difference between twins and singletons in the mean age of mothers. However, mothers of DZ twins were significantly older than mothers of MZ twins in both males and females. In the female group, fathers' ages were not significantly different between MZ and DZ twins or between twins and singletons. In the male group, although the mean age of fathers of twins was not significantly different from that of fathers of singletons, fathers of DZ twins were significantly older than fathers of MZ twins.

In both gender groups, the parents of MZ twins were not significantly different from the parents of DZ twins in years of education. However, the parents of singletons were slightly but significantly higher in years of education than the parents of twins in both male and female samples.

Model-Fitting Analyses

Tables 2 and 3 show the results of model-fitting analyses for the male and female sample, respectively. When we equated the means and variances for the six cluster scales of the P-H for first- and second-born twins in each zygosity group from the full model (Model 1), no significant change in $-2LL$ occurred in any of the scales except for Behavior in the female sample. These results suggest that there is little difference between

Table 2

Model-Fitting Results in the Male Sample

		Unequal (Full Model)		Equal within Zyg group (Model 1)		MZ = DZ (Model 2)		MZ = DZ = Singletons (Model 3)	
Scale		$-2LL$	*df*	$\Delta -2LL(2df)$	*p*	$\Delta -2LL(3df)$	*p*	$\Delta -2LL\ (4df)$	*p*
Popularity	Mean	4348.3	910	1.70	.43	1.90	.59	15.37	.00
	Variance	4348.3	910	6.09	.05	6.28	.10	7.03	.13
Physical	Mean	4734.4	909	0.13	.94	1.59	.66	48.07	.00
	Variance	4734.4	909	1.33	.51	1.33	.72	2.88	.58
Anxiety	Mean	4238.8	909	0.45	.80	1.37	.71	8.37	.08
	Variance	4238.8	909	0.44	.80	0.44	.93	4.87	.30
Happiness	Mean	4195.6	909	0.72	.70	0.83	.84	20.67	.00
	Variance	4195.6	909	0.10	.95	0.69	.88	6.43	.17
Intellectual	Mean	4828.2	910	3.31	.19	3.35	.34	20.54	.00
	Variance	4828.2	910	2.94	.23	3.21	.36	4.77	.31
Behavior	Mean	4405.6	910	0.46	.79	1.86	.60	6.57	.16
	Variance	4405.6	910	0.52	.77	0.62	.89	0.66	.96

Note: Physical = Physical Appearance and Attributes; Happiness = Happiness and Satisfaction; Intellectual = Intellectual Competence and School Status.

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Table 3

Model-Fitting Results in the Female Sample

		Unequal (Full Model)		Equal within Zyg group (Model 1)		MZ = DZ (Model 2)		MZ = DZ = Singletons (Model 3)	
Scale		$-2LL$	df	$\Delta -2LL(2df)$	p	$\Delta -2LL(3df)$	p	$\Delta -2LL(4df)$	p
Popularity	Mean	4499.0	948	0.03	.98	0.51	.92	2.76	.60
	Variance	4499.0	948	2.19	.33	6.78	.08	7.49	.11
Physical	Mean	4895.2	940	0.22	.90	0.90	.82	29.00	.00
	Variance	4895.2	940	2.00	.37	3.18	.37	3.31	.51
Anxiety	Mean	4471.1	950	2.17	.34	3.35	.34	3.94	.41
	Variance	4471.1	950	0.91	.64	7.63	.05	12.08	.02
Happiness	Mean	4215.5	950	0.53	.77	2.60	.46	9.80	.05
	Variance	4215.5	950	2.65	.27	13.50	.00	17.83	.00
Intellectual	Mean	5022.6	945	2.12	.35	2.12	.55	7.65	.11
	Variance	5022.6	945	2.40	.30	2.40	.49	2.40	.66
Behavior	Mean	4555.8	949	7.93	.02	9.00	.03	14.90	.01
	Variance	4555.8	949	16.20	.00	16.50	.00	19.10	.00

Note: Physical = Physical Appearance and Attributes; Happiness = Happiness and Satisfaction; Intellectual = Intellectual Competence and School Status.

first- and second-born twins in various domains of self-concept.

Next, we equated means and variances for the six cluster scales of the P-H between MZ and DZ twins (Model 2). Again, except for the Behavior scale, no significant change in $-2LL$ occurred when we set means for the six cluster scales of the P-H to be equal between the two zygosity groups. When we equated variances, two of the six scales, that is, Behavior, and Happiness and Satisfaction yielded significant changes in $-2LL$. Finally, we equated means and variances for the six cluster scales of the P-H between singletons and twins (Model 3). Equating means resulted in a significant change in $-2LL$ for every scale except Anxiety and Behavior in the male sample and except Popularity, Anxiety, and Intellectual Competence and School Status in the female sample. These results indicate that twins are different from singletons in the mean level of various dimensions of self-concept. Equating variances across singletons and twins resulted in no significant changes in $-2LL$ for any of the six scales in the male sample. In the female sample, however, a significant change in $-2LL$ occurred for three of the six scales, that is, Anxiety, Happiness and Satisfaction, and Behavior.

Effect Sizes of Differences

Tables 4 and 5 present means and standard deviations for the six cluster scales of the P-H for MZ and DZ twins and singletons and effect sizes of differences for the scores between MZ and DZ twins and between singletons and twins for males and females. When MZ twins were compared to DZ twins, in both male and female samples, effect sizes of differences were below .20 for all of the six cluster scales of the P-H, suggesting that MZ and DZ twins are generally comparable in various dimensions of self-concept. When twins were compared to singletons, however, mean scores for twins were consistently higher than those for singletons, indicating that twins have higher self-concept

Table 4

Means (Standard Deviations) for the Six Cluster Scales of the Piers-Harris Children's Self-Concept Scale for MZ and DZ Twins and Singletons and Effect Sizes (d) of the Differences Between MZ and DZ Twins and Between Singletons and Twins in the Male Sample

		Twins			d	
Scale	Singletons	MZ	DZ	Total	MZ vs. DZ	S vs. Twins
Popularity	7.5 (2.6)	8.3 (2.5)	8.4 (2.7)	8.3 (2.6)	.04	.31
Physical Appearance	5.3 (3.2)	7.4 (3.5)	7.7 (3.6)	7.5 (3.5)	.08	.66
Anxiety	7.3 (2.5)	7.9 (2.2)	7.7 (2.3)	7.8 (2.3)	.09	.21
Happiness	7.1 (2.5)	8.0 (2.1)	8.0 (2.5)	8.0 (2.2)	.00	.38
Intellectual	9.1 (3.3)	10.4 (3.6)	10.4 (3.8)	10.4 (3.6)	.00	.38
Behavior	10.6 (2.7)	11.3 (2.6)	10.8 (3.0)	11.1 (2.8)	.18	.18

Note: d = the absolute difference between group means divided by a pooled estimate of the standard deviation. S = singletons. Physical = Physical Appearance and Attributes; Happiness = Happiness and Satisfaction; Intellectual = Intellectual Competence and School Status.

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Table 5

Means (Standard Deviations) for the Six Cluster Scales of the Piers-Harris Children's Self-Concept Scale for MZ and DZ Twins and Singletons and Effect Sizes (*d*) of the Differences Between MZ and DZ Twins and Between Singletons and Twins in the Female Sample

		Twins			*d*	
Scale	Singletons	MZ	DZ	Total	MZ vs. DZ	S vs. Twins
Popularity	8.3 (2.6)	8.7 (2.3)	8.6 (2.7)	8.7 (2.4)	.04	.16
Physical Appearance	6.3 (3.3)	8.0 (3.2)	7.9 (3.4)	8.0 (3.3)	.03	.52
Anxiety	7.2 (2.6)	7.4 (2.1)	7.0 (2.6)	7.3 (2.3)	.17	.04
Happiness	7.6 (2.3)	8.2 (1.8)	7.9 (2.2)	8.1 (2.0)	.15	.23
Intellectual	10.0 (3.6)	10.8 (3.6)	10.8 (3.6)	10.8 (3.6)	.00	.22
Behavior	11.2 (2.8)	11.7 (2.5)	11.8 (2.3)	11.7 (2.4)	.04	.19

Note: *d* = the absolute difference between group means divided by a pooled estimate of the standard deviation. S = singletons. Physical = Physical Appearance and Attributes; Happiness = Happiness and Satisfaction; Intellectual = Intellectual Competence and School Status.

than singletons. Nonetheless, the effect size of difference exceeded the medium level only for the Physical Appearance and Attributes scale in both males (d = .66) and females (d = .52). The effect sizes of differences were small (0.04 to 0.38) for the remaining five scales. These results suggest that even if twins are consistently higher than singletons in all self-concept domains, the magnitude of differences between the two groups tends to be modest in general.

Discussion

Comparison of the six cluster scales of the P-H in twins and singletons allowed us to draw three conclusions. First, first- and second-born twins were generally comparable in means and variances for various dimensions of self-concept, suggesting that birth order is not important in determining self-concept in twins. Second, MZ and DZ twins were similar in various domains of self-concept, indicating little zygosity effect on self-concept. Finally, twins exceeded singletons for all six domains of self-concept. However, the effect sizes of differences between the two groups were small except for one scale, Physical Appearance and Attributes.

Twins are usually conscious of which twin was born first. In many cultures, the first-born is regarded as the senior and expected to have traits characteristic of the eldest child in a family including high self-esteem, leadership skills, and aggression (Bryan, 2005). The results of the present study, however, do not support the common notion that the first-born may have more adaptive characteristics than the second-born twin.

Slightly higher means observed in the present study for most dimensions of self-concept in twins than in singletons replicate well the Finnish twin study (Pulkkinen et al., 2003) that twins are higher in adaptive adjustment than singletons. Thorpe (2003) argues that the social world of twins is one which necessitates greater levels of interaction, providing experience of negotiation, sharing and turn-taking. Because of this unique twin situation, twin children may have more opportunities to learn and practice appropriate social behaviors and relationship skills than do singleton children. Also, a child in a twin pair has a lifelong and constant relationship with an individual of the same age. These experiences of twins may positively influence the development of social adjustment and emotional wellbeing and consequently, may have contributed to the slightly raised levels of self-concept found in the present study. In the present analyses, an increased level of self-concept in twins was most pronounced in the domain of Physical Appearance and Attributes. It is likely that elementary school twins gain attentions from their peers and teachers due to their physical similarities, which in turn may have elevated their physical appearance self-concept.

The Pulkkinen et al. study (2003) found that females in opposite-sex DZ pairs scored higher than those in same-sex DZ pairs in socially active behavior, whereas males in opposite-sex DZ pairs scored higher than those in same-sex DZ pairs in compliant and constructive behavior, suggesting evidence for the effect of cross-sex socialization (or *in utero* hormonal transfer). In the present study, however, the scores of females in same-sex DZ pairs were not significantly different from those of females in opposite-sex DZ pairs in any of the six self-concept scales. The same pattern was observed in male same-sex and opposite-sex DZ twin pairs. The discrepancy of findings between the Pulkkinen et al. (2003) study and this study may be due to the small sample size of opposite-sex twins employed in this study and/or cultural differences between Finland and South Korea.

There are limitations of the present study that need to be addressed. First, although we attempted to match the twin and singleton samples in terms of parental years of education, the parents of singletons were found to be more educated than the parents of twins in the present study. Very unexpectedly, however, singletons scored lower than twins in various dimensions of self-concept in the present study. Consistent with previous studies (Cozart, 1989; Richman, 1985; Trusty, 1994), small but positive correlations (r = .06 ~ .22) between

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parental years of education and self-concept were observed in the present study. Given the positive relationship between parental socioeconomic status and children's self-concept, our findings suggest that the discrepancies of scores on various facets of self-concept between twins and singletons may have been larger than those found in the present study if we had been able to match parental years of education well between the singleton and the twin sample. A better design to test possible differences between singletons and twins would be to compare twins and their singleton siblings, as this comparison within families allows researchers to effectively control the impacts of health/wellbeing, by parental socioeconomic status, school, neighborhood, familial circumstances, and other demographic characteristics.

Second, the conclusions drawn from the present study are necessarily limited to elementary school children. Previous studies on the basis of singletons have shown that self-concept declines significantly as young children become adolescents (Jacobs et al., 2002). It would be interesting future research to investigate whether the self-concepts of twins drop in adolescence as those of singletons do, and whether the small differences in various domains of self-concept between twin and singleton children found in the present study persist into adolescence and adulthood.

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