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Changes in Aggression among Mainland Chinese Elementary, Junior High, and Senior High School Students across Years: A Cross-Temporal Meta-Analysis.

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Abstract: This study examined whether aggression among students in China rose or fell during 2003-2016. We applied a *cross-temporal meta-analysis* of 90 studies using *Aggression Questionnaire* (Buss & Perry, 1992) responses by 87,319 students (primary school students through senior high students). The results showed less aggression in later years. The decline in aggression was greater among junior high school students than among other students. Otherwise, the decline in aggression did not differ across gender or across regions (Eastern China, Central China, Western China).

Keywords: aggression; cross-temporal meta-analysis; meta-analysis; adolescents; Chinese

1 Introduction

School violence victimizes about half of students worldwide, including over thirty percent of students in China (WHO, 2018). Furthermore, understanding students' deliberate physical or psychological harming of others (*aggression*, Anderson & Bushman, 2002) is critical to eventually reducing aggression. Whereas many studies have examined proximal factors for aggression, fewer studies examined the country-level changes across time that might influence aggression. This study takes a step in this direction via a cross-temporal meta-analysis of 90 studies of the aggression of 87,319 students (primary school to senior high school) in China during 2003-2016.

1.2 General Aggression Model

The *general aggression model* (GAM, Anderson & Bushman, 2002) consists of proximate and distal processes. In GAM's proximate processes, person and situation *inputs* influence a person's internal state (cognitions, feelings, and arousal), which affect appraisal and decision *routes*, which in turn influence aggressive (vs. non-aggressive) behavioral *outcomes* (Allen, Anderson & Bushman, 2018). For example, students with less self-esteem or more sensitivity to rejection show more aggression (Gao, Assink, Liu, Chan, & Ip, 2019; Shi, Zhang & Fan, 2017; Teng, Liu & Guo, 2015). Each episode of aggression (or non-aggression) serves as a learning trial that can influence the development of aggressive knowledge structures (and thereby personality) over time (Allen et al., 2018). In contrast, GAM's distal processes detail how biological and persistent environmental factors can influence aggression through changes in knowledge structures (Anderson & Bushman, 2002). In this study, we focus on distal processes, specifically country-level changes in China across time, regional differences, age differences, and gender differences.

Some researchers argued that greater (a) awareness of others (via population density and the internet), and (b) economic development can reduce aggression among students over time. First, greater population density or superior communication technology (e.g., internet) has increased people's awareness of one another's aggressions and harmful consequences, which might reduce student aggression (Hilbe & Sigmund, 2010; Perc & Szolnoki, 2010; Pinker, 2012). Greater population density tends to increase the number of people with whom a person interacts (Pan, Ghoshal, Krumme, Cebrian & Pentland, 2013). Likewise, a person can use the internet to access many more diverse people's experiences quickly, easily, and more directly than before (cf. books, radio, television, Wei, 2012). As a result, such a person's knowledge structures change, becoming increasingly aware of other people's aggression and often harmful consequences suffered by the aggressor, such as retribution and ostracism (Perc & Szolnoki, 2010). Furthermore, such a person is more likely to use non-aggressive strategies (e.g., negotiation) rather than aggression to pursue their goals (Hilbe & Sigmund, 2010). Over time, greater population density and information access shows less violence and aggression across centuries of data (Pinker, 2012). As population density has increased much more in China's eastern region than its central or western regions (Liu, Gao & Lu, 2017), this decrease in aggression might also be greater in its eastern region.

Secondly, China's economic growth has raised young people's level of schooling and reduced family poverty (Meng, Gregory & Wang, 2005), which coincides with less authoritarian parenting, more pro-social behaviors and less aggression. Better schooling often increases societally-acceptable behaviors and reduces unacceptable aggressive behaviors (Li, 2014; Warburton & Anderson, 2015). As fewer families in China are in poverty, parents face less economic and psychological stress, and show less aggression, serving as role models for their children who also show less aggression (Aguilar et al., 2000). Specifically, parents in China are more likely than before to seek their children's compliance through greater understanding and less likely to demand their children's strict obedience via corporal punishment (*authoritarian*, Chen, Dong & Zhou, 1997; Chen, Zhang, & Xia, 2011; Liu, Xu & Zou, 2012; Lu & Chang, 2013). This, in turn, enhances their children's knowledge structures regarding the benefits of desirable behaviors rather than aggressive ones, which reduces their aggression (Casas et al., 2006; Farrington, 2009; Joireman, Anderson, & Strathman, 2003). As economic growth and education investment rose much faster in China's eastern region than in its central or western regions, aggression might also fall more in its eastern region than in its other regions. Together, these past studies suggest the following two hypotheses:

H-1a. Aggression by students in China is lower in later years (2003-2016).

H-2. The reduction in aggression by students in later years (2003-2016) is greater in Eastern China than in other parts of China.

However, other researchers argue that student aggression has increased over time. Specifically, the internet facilitates greater access not only to other people's experiences but also to violent media. Children with greater exposure to violent media might acquire different knowledge structures, as they become less sensitive to violence, are more willing to use it, and hence, show greater aggression (Cho, Lee, Choi, Choi, & Kim, 2017; Gentile, Bender, & Anderson, 2017; Greitemeyer, 2018). Hence, greater access to the internet might increase aggression rather than reduce it, suggesting a competing hypothesis.

H-1b. Aggression by students in China is higher in later years (2003-2016).

Furthermore, middle-school students face many changes that render them more vulnerable to external environments that might affect their aggression. Middle-school students undergo puberty and transition to new schools, which add more stress to their lives and renders them more sensitive to environmental factors than to those of students at other ages (Campbell et al., 2006; Casey et al., 2010; Tapper & Boulton, 2000; Toldos, 2005). As a result, middle-school students might benefit more than other students from protective environmental factors (population density, internet, economic growth) and be harmed more by harmful environmental factors (e.g., poverty's economic and psychological stressors). Hence, these distal environmental factors might influence the knowledge structures and aggression of middle-school students more than those of other students.

H-3. The reduction in aggression in later years (2003-2016) is greater in middle-school students than in other students in China.

Also, males are typically physically larger and stronger than females and show more aggression, especially physical aggression, at all ages, from early childhood through adulthood (Björkqvist, 1994; Warburton & Anderson, 2015). Hence, males might benefit the most from protective environmental factors (population density, internet, economic growth) or be harmed the most by harmful environmental factors (e.g., poverty's economic and psychological stressors). As a result, these distal environmental factors might affect the knowledge structures and aggression of male students more than those of female students.

H-4. The reduction in aggression in later years (2003-2016) is greater among male students than among female students in China.

2 Materials and Methods

Past empirical studies of aggression often analyzed data from different time periods, regions or age groups without modeling them (Sun, Zhang, & Zhou, 2013; Xia et al., 2016), which can cause *omitted variable bias* (Kennedy, 2008). Therefore, we propose adopting a new approach, *cross-temporal meta-analysis* (CTMA). CTMA tests whether aggression by students in China rose or fell over time and whether region, age or gender moderate this relation.

As many studies in China used the Aggression Questionnaire (AQ, Buss & Perry, 1992; Li, Li, & Zhang, 2017), this meta-analysis examined only studies using AQ to facilitate interpretation of the results. The AQ has 29 items within four dimensions: physical aggression, verbal aggression, hostility, and anger (e.g., "Some of my friends think I am a hothead"). Possible responses are on a 5-point scale from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). Past studies showed internal consistencies (Cronbach's alpha) ranging from 0.60 to 0.89 and intraclass correlation coefficients of 0.57 to 0.81. Past studies of AQ showed evidence of gender invariance (e.g., Bryant & Smith, 2001) and age invariance (e.g., Fossati, Maffei, Acquarini & Di Ceglie, 2003).

2.1 Literature search

We searched the following databases: PubMed, PsycINFO, Google Scholar, and three of China's largest databases (China National Knowledge Internet, Wanfang, and Chongqing VIP Information). We used the following search terms: "student," "junior high school students," "high school students," "senior high school," "aggression," "bully," "act of violence," and "aggressive behavior." As the AQ instrument was introduced to China in 2003, we searched for studies published between January 2003 and December 2018.

This study followed previous studies (Oliver & Hyde, 1993; Twenge, et al., 2010; Twenge & Im, 2007; Xin, Niu, & Chi, 2012) and subtracted 2 years from the year of publication as a proxy for the date of actual data collection (which might be an underestimate or overestimate). (Analyses of both [a] all 90 studies and [b] the subsample of 38 studies that reported the year of data collection yielded similar results [results available from the author upon request]).

2.2 Study selection process and inclusion criteria

We applied these inclusion criteria: (1) studies used the AQ; (2) study participants were students in China aged 5-24 years; (3) studies reported means, standard deviations, and sample sizes, or email correspondence with the study authors yielded this information (if authors did not respond within 1 month, we excluded their data); (4) if an author used the same dataset in multiple studies, we included only one study; and (5) the articles were published between January 2005 and December 2018. We excluded studies that did not meet any of these criterion.

See specific literature search and selection strategies in the flow diagram in Figure 1 (Moher et al., 2009). As shown in the diagram, we identified 4,012 articles in the search, and removed 2,597 duplicates during the initial screening. As per inclusion criteria, we excluded another 2,507 articles, leaving 90 studies to be used in our meta-analysis. Table 1 shows the distribution of the number of studies and their sample sizes according to the data collection year.

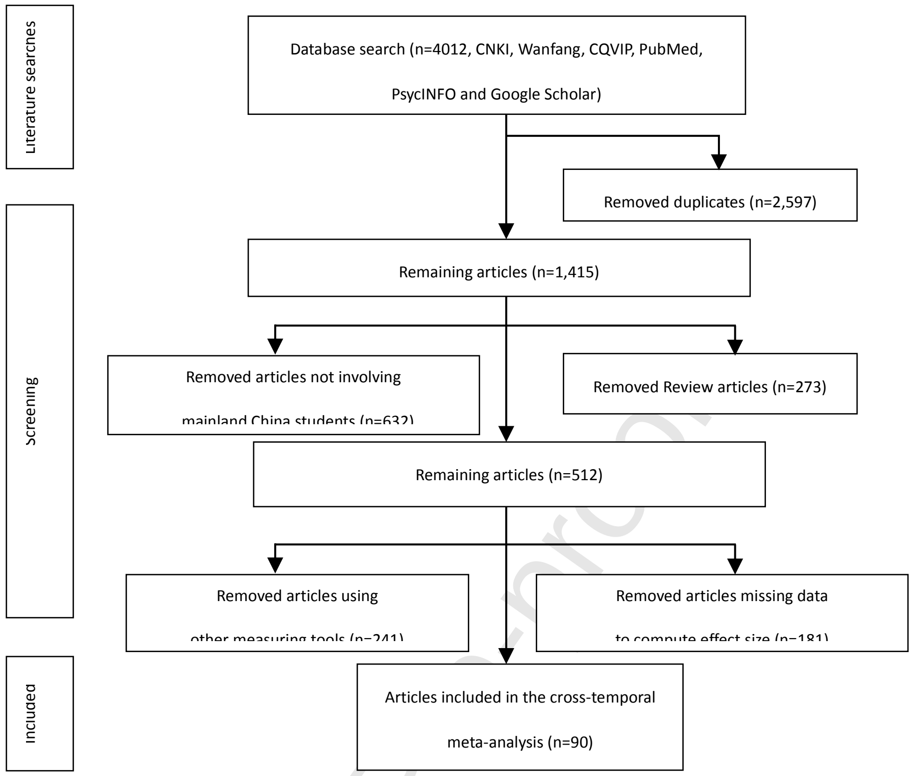

Figure 1. PRISMA diagram of the search strategies and inclusion process

CNKI: China National Knowledge Internet; CQVIP: Chongqing VIP Information.

Table 1 Distribution of survey samples from 2003 to 2016

	Year of collection	Author	N	M	SD	Female %	Region[a]	Age[b]
1	2003	Zhang	1762	83.26	15.32	51.50%	E	2
2	2003	Zhang	458	87.54	15.17	46.70%	E	2
3	2004	Dai et al.	111	83.74	14.65	36.94%	NA	2
4	2005	Zhang	458	99.88	25.00	46.72%	E	2
5	2006	Sun and Cui	263	77.51	21.56	51.33%	C	1
6	2007	Li et al.	379	80.62	17.71	45.65%	E	2
7	2007	Tian	1229	80.51	15.21	49.55%	W	1
8	2008	Ge and Zhao	310	76.46	18.52	56.77%	E	2
9	2008	Fan	213	81.53	15.60	57.28%	W	3
10	2008	Li	846	76.42	18.49	50.40%	E	Mixed
11	2009	Dai	485	78.89	15.52	58.80%	C	3
12	2009	Ding	181	79.91	16.19	57.46%	NA	3
13	2009	Feng	373	74.82	17.11	48.53%	C	2
14	2009	Jiang et al.	357	81.12	17.72	46.78%	W	3
15	2009	Luo	457	80.35	13.07	45.08%	C	3
16	2009	Yan and Luo	482	80.35	13.07	43.78%	C	2
17	2010	Du et al.	236	77.49	16.43	58.90%	C	1
18	2010	Gu	2626	72.27	16.02	44.10%	C	Mixed
19	2010	Nie et al.	829	76.26	18.45	51.39%	E	2
20	2010	Wang	414	80.33	15.37	46.60%	W	3
21	2010	Zhang	1014	77.08	16.84	46.06%	E	1
22	2010	Zou et al.	182	76.27	18.46	0.00%	C	2
23	2011	Bai and Jiang	357	77.49	16.43	46.78%	W	2
24	2011	Fan et al.	351	76.22	15.45	51.57%	C	1
25	2011	Ji	938	74.33	16.67	55.65%	C	Mixed

26	2011	Ji et al.	720	69.89	16.82	49.58%	E	2
27	2011	Ouyang	651	72.00	15.18	53.30%	C	3
28	2011	Teng	1085	73.39	13.37	29.59%	W	3
29	2011	Yang [a]	8166	70.24	17.98	49.80%	NA	1
30	2011	Yang [b]	7807	71.54	16.27	49.93%	NA	2
31	2011	Yang [c]	7931	71.61	15.51	53.06%	NA	3
32	2011	Yao	166	79.73	13.91	55.42%	NA	2
33	2011	Zhang	607	79.35	14.32	54.90%	E	3
34	2011	Zhang et al	190	75.23	15.32	50.00%	W	3
35	2011	Zheng	1096	77.05	17.41	58.80%	NA	Mixed
36	2011	Zu	5892	76.69	14.65	48.30%	C	3
37	2012	Duan et al.	464	79.84	14.30	55.82%	E	3
38	2012	Hou	491	80.22	18.66	56.62%	C	2
39	2012	Jiang et al.	460	63.77	10.52	50.22%	W	2
40	2012	Wang	490	81.2	15.65	44.10%	C	2
41	2012	Yao	343	78.83	18.18	52.30%	W	3
42	2012	Yu	560	75.40	19.43	47.00%	C	2
43	2013	Dou et al.	3213	73.66	17.32	51.00%	W	3
44	2013	Li et al.	180	89.09	19.26	50.00%	C	2
45	2013	Ou	418	67.42	16.18	49.76%	C	1
46	2013	Wang	414	80.33	15.37	46.62%	W	3
47	2013	Yan	324	64.47	20.55	48.50%	C	1
48	2014	Cao	206	71.63	10.71	45.63%	E	1
49	2014	Chen	231	82.46	17.36	49.78%	E	3
50	2014	Gao	650	71.88	18.95	54.77%	C	Mixed
51	2014	Han et al.	2958	63.60	23.65	47.23%	C	2
52	2014	Jiang	193	75.56	13.36	47.67%	C	2

53	2014	Li	351	68.15	17.51	47.30%	C	1
54	2014	Luo	749	62.57	18.83	46.33%	C	2
55	2014	Pan and Gao	411	80.22	9.64	51.09%	NA	2
56	2014	Wang et al	357	82.07	13.63	50.00%	NA	3
57	2014	Yang	158	83.79	22.42	45.57%	C	1
58	2014	Zhang a	364	68.15	12.21	55.49%	W	3
59	2014	Zhang [b]	2768	67.69	22.92	53.50%	C	3
60	2015	Cheng	377	79.75	16.30	46.15%	C	2
61	2015	Cui	455	75.35	17.43	43.08%	E	Mixed
62	2015	Hao	310	71.13	14.44	52.90%	E	1
63	2015	He et al.	309	76.16	22.52	52.40%	NA	2
64	2015	Hu	347	75.00	13.32	51.01%	E	2
65	2015	Huang	380	71.19	17.67	47.89%	C	2
66	2015	Jiang	827	71.89	16.67	37.20%	C	2
67	2015	Li	470	77.84	14.60	55.11%	C	3
68	2015	Li et al.	505	72.51	16.90	48.71%	NA	2
69	2015	Liu et al.	1174	72.21	17.72	55.03%	C	3
70	2015	Ma	660	72.21	15.34	51.82%	C	2
71	2015	Wang [a]	852	75.41	17.43	53.64%	C	Mixed
72	2015	Wang [b]	1013	77.90	19.74	48.20%	C	2
73	2015	Wang [c]	463	71.98	13.31	49.68%	C	2
74	2015	Zhang [a]	529	73.33	15.12	58.60%	C	3
75	2015	Zhang [b]	423	78.62	14.89	57.70%	W	Mixed
76	2015	Zhu	397	70.38	16.71	45.60%	C	2
77	2015	Zhuang	552	74.52	16.18	51.60%	E	2
78	2016	Fan	3176	70.91	12.28	52.52%	E	Mixed
79	2016	Hu	1448	69.91	13.49	52.40%	E	2

80	2016	Li	410	74.82	17.40	52.44%	E	1
81	2016	Li et al.	402	60.12	16.65	59.30%	E	3
82	2016	Liu	582	69.01	13.31	50.52%	E	1
83	2016	Shao et al.	197	73.29	18.43	72.59%	E	3
84	2016	Song	122	70.48	15.46	54.17%	E	1
85	2016	Wang et al	397	72.50	14.50	60.71%	C	3
86	2016	Wen	900	70.21	14.34	52.90%	C	Mixed
87	2016	Ye	551	68.88	13.32	46.50%	E	2
88	2016	Zhang [a]	1400	69.79	20.69	49.27%	E	1
89	2016	Zhang [b]	308	71.88	16.94	50%	E	1
90	2016	Zheng	474	74.34	16.12	49.80%	E	2

[a] E = Eastern, C = Central, W = Western, NA = not applicable

[b] 1 = elementary school, 2 = junior high school, 3 = senior high school

As all of the studies used convenience samples rather than representative samples, some of them might have selection bias. All studies asked participants to respond to surveys anonymously. None of the participants withdrew or dropped out. Participant responses were analyzed with correlations and regressions, controlling for year, geographic region, age, and gender.

2.3 Cross-temporal meta-analysis

We track and analyze scores from a specific population (students in China) on a standardized, validated, psychological test over a long period of time with a CTMA (Twenge, 2000). Unlike traditional meta-analyses, a CTMA coherently connects isolated studies in chronological order, presenting existing studies as cross-sectional samples of historical development to describe time trends (Twenge, Zhang & Im, 2004). For other examples of CTMA, see Karazsia, Murnen, and Tylka (2017) Mackenzie, Erickson, Deane, and Wright (2014), and Wongupparaj, Kumari and Morris (2015).

2.3.1 CTMA strengths and weaknesses

CTMA has high statistical power, tests for moderation with study-level variables, tests the robustness of different study procedures, and allows comparison of differences across time; however, it often has more measurement error and cannot control for individual differences. Like other meta-analyses, CTMA capitalizes on a larger sample size from many cross-sectional studies to increase its statistical power, tests for moderation by variables at the level of each subordinate study (e.g., location) and tests the robustness of study results with different procedures. Furthermore, CTMA allows testing of differences across time.

CTMA weaknesses include measurement error, effect size errors, and correlations among variables at different levels. As with other meta-analyses, unaccounted differences among its component studies increase measurement error (Hedges & Olkin, 2014). Simulations also show that CTMA tends to overestimate small effect sizes and underestimate large effect sizes (Rudolph, Costanza, & Zacher, 2018).

As CTMA tests for correlations among variables at different levels (individual and population, it ignores the relative size of individual-level effects within their cohorts (Klein, Danserau, & Hall, 1994), and cannot identify Simpson's paradox effects (Rudolph, Costanza, & Zacher, 2018). As different people are measured at different times, it cannot control for individual differences, unlike longitudinal studies (Twenge, 2000). Though, by examining students of different ages and geographical regions in the same year, we can distinguish age, geographical cohort, and year effects.

2.3.2 Procedure

After collecting the summary statistics from all 90 selected studies, we computed the overall mean aggression across all studies (M) from each study's sample mean (m_i) and sample size (n_i).

$$M = \sum m_i n_i / \sum n_i \qquad (1)$$

Next, we computed the overall standard deviation across all studies (S_T) from m_i, n_i, M, and each study's sample standard deviation (s_i).

$$S_T = \sqrt{[\sum n_i\, s_i^2 + \sum n_i\, (m_i - M)^2]/\sum n_i}\sqrt{[\sum n_i\, s_i^2 + \sum n_i\, (m_i - M)^2]/\sum n_i} \qquad (2)$$

Then, we compute the difference in aggression over the past 13 years by calculating the effect size (Cohen's d) with S_T and the mean aggression in 2003 (M_{2003}) and in 2016 (M_{2016}).

$$d = (M_{2016} - M_{2003}) / S_T \qquad (3)$$

Next, we compute the coefficient of determination (r^2) with d.

$$r^2 = d^2 / (d^2+4) \tag{4}$$

Then, we compute the standard deviation of each study accounting for differences between males and females, sd_i.

$$sd_i = \sqrt{[(n_e-1)s_e^2+(n_c-1)s_c^2]/(n_e+n_c-2)} \tag{5}$$

Next, we compute the gender effect size of each study i (d_i) from sd_i , and the mean aggressions of females and males (m_{female} , m_{male})

$$\sqrt{[(n_e-1)s_e^2+(n_c-1)s_c^2]/(n_e+n_c-2)}d_i = (m_{female} - m_{male}) / sd_i \tag{6}$$

Then, we compute the weight of each study (w_i) from d_i and n_i.

$$w_i = 2n_i / (8 + d_i^2) \tag{7}$$

Next, we compute the mean effect size $\bar{d}$ in each year from w_i and d_i.

$$\bar{d} = \sum w_i\, d_i \sum w_i\, d_i / \sum w_i\ \sum w_i \tag{8}$$

Then, we run a fixed-effects regression with the outcome mean aggression effect size in each year $\bar{d}$. First, we add the explanatory variable *year*. Then, we add the explanatory variables *East_China* and *Central_China* (vs. Western China), *middle_school* and *high_school* (vs. primary school student), and *female* (vs. male). Lastly, we test for moderation via the following interaction variables: *year*East_China*, *year*Central_China*, *year*middle_school*, *year*high_school*, and *year*female*.

When testing whether explanatory variables have different effect sizes, Wald and likelihood ratio tests do not apply at boundary points. Hence, we use *Lagrange multiplier tests* which apply to all parts of a data set and show greater statistical power than Wald or likelihood ratio tests for small deviations from the null hypothesis (Bertsekas, 2014).

3 Results

The overall mean aggression across studies was 75.503 (SD = 6.081), ranging from a low of 60.120 to a high of 99.880. Within each study, the standard deviations varied from 9.64 to 25.00. The data was heterogeneous in many other ways, including region, age and gender, as shown below.

3.1 Correlation between aggression score and year

Student aggression was negatively correlated with time (r = -0.557). A scatter diagram of mean aggression scores against time shows a downward trend over time, supporting hypothesis H-1a and rejecting H-1b (see Figure 2).

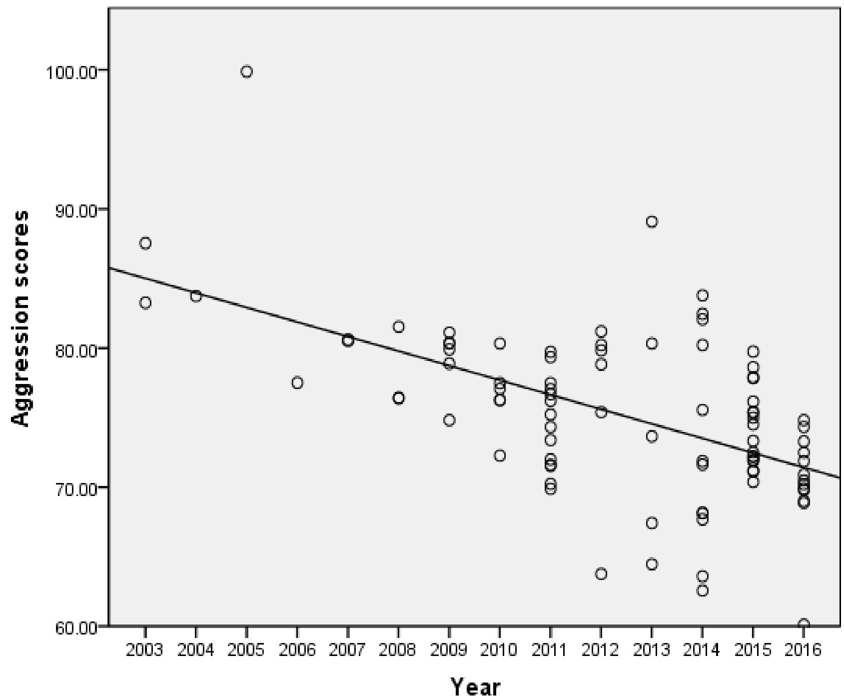

Figure 2. Change in aggression level among Chinese adolescences from 2003 to 2016

Regression results corroborate the correlation and graph results. In later years, aggression was significantly lower (β = -0.557; R^2 = 0.310). Weighting the sample sizes in the above regression shows even stronger, significant results (β = -0.522; R^2 = 0.272). As shown in Table 2, the aggression score of students in mainland China decreased by nearly one point per year (d = -0.731) and nearly 12 points from 2003 to 2016 (M_{change} = -11.996). The explanatory variable *year* accounted for 19% of the total variance in the *aggression* effect size *d* (r^2 = 0.119). As the data had no extreme outliers, all data were included in all analyses.

Table 2 Effect size and explanatory power of time period on student aggression

	M_{2003}	M_{2016}	M_{change}	*SD*	*d*	r^2
Aggression	80.682	68.686	-11.996	16.406	-0.731	.119

3.3 Changes in student aggression in different regions over time

We also examined region-specific studies of student aggression: 28 of Eastern China, 39 of Central China, and 13 of Western China. The weighted regression results showed lower student aggression in later years in all three regions (Eastern: β = -0.484; R^2 = 0.234; r^2 = .145; Central: β = -0.461; R^2 = 0.213; r^2 = .105; Western: β = -0.459; R^2 = 0.211; r^2 = .100; see Table 3). Between 2003 and 2016, student aggression fell by nearly 13 points in Eastern China (SD = 15.791; d = -0.823), by nearly 12 points in Central China (SD = 17.042; d = 0.684), and by over 10 points in Western China (SD = 15.193; d = 0.668). Lagrange multiplier test (χ^2=1.03, *P*>.05) showed that these differences across regions were not significant, showing no support for H-2.

Table 3 Changes in aggression level among students in different regions

			Years		*Variable Quantity*			
Region	*N*	%	β	R^2	M_{change}	*SD*	d_{change}	r^2_{change}
Eastern	19,552	32.4	-0.484**	.234	-12.991	15.791	-0.823	.145
Central	31,776	52.6	-0.461**	.213	-11.660	17.042	-0.684	.105
Western	9,062	15.0	-0.459*	.211	-10.143	15.193	-0.668	.100

Note: * $p < 0.05$, ** $p < 0.01$.

β = standardized regression coefficient of the regression analysis of aggression by years; R^2 = explained power of β.

M_{change} = difference between mean aggression scores in first and last year; *SD* = mean of all standard deviations; *d* = effect size; r^2 = explanatory power of *d*.

3.4 Changes in aggression among students of different ages over time

The results also showed that aggression was lower across time for students of all different age groups: elementary school (17 studies), junior high school (37), and senior high school (26). Aggression was lower in later years among all sets of students (see Table 4). From 2003 to 2016, aggression fell among primary school students (-9.888), junior high school students (-32.549), and senior high school students (-12.600). Furthermore, Lagrange multiplier test (χ^2=12.06, P<.01) showed that the decline in aggression across time was significantly higher for junior high school students than for all other students, supporting H-3.

Table 4 Changes in aggression level among students of different ages

Age group	*N*	%	β	R^2	M_{change}	*SD*	*d*	r^2
Elementary	15,848	21.0	-0.551**	.304	-9.888	17.00	-0.581	.078
Junior high	29,728	39.4	-0.817**	.668	-32.549	16.58	-1.963	.491
Senior high	29,786	39.5	-0.628**	.395	-12.600	15.19	-0.829	.147

3.5 Changes in aggression among students of different genders over time

We also examined gender differences during 2003 to 2016 in the 68 studies with gender data. The weighted regression results showed less aggression in later years among both males and females (male: β = -0.280; R^2 = 0.078; r^2 = .399; female: β = -0.238; R^2 = 0.057; r^2 =.304; see Table 5). Further analyses found that between 2003 and 2016, aggression by males fell by nearly 24 points (SD = 15; d = -1.631) and by females fell by over 18 points (SD = 14; d = -1.322). *Year* accounted for substantial portions of the variance among both males (40%) and females (30%). Lagrange multiplier test (χ^2=1.167, P>.05) showed that the lower student aggression across time did not differ significantly across gender, showing no support for H-4.

Table 5 Changes in aggression level for each gender

	N	%	β	R^2	M_{change}	*SD*	*d*	r^2
Male	27,752	48.7	-0.280*	.078	-23.738	14.551	-1.631	.399
Female	28,688	51.3	-0.238*	.057	-18.642	14.106	-1.322	.304

4 Discussion

We investigated student aggression in mainland China during 2003-2016 via cross-temporal meta-analysis of 90 studies using the Aggression Questionnaire (Buss & Perry, 1992). The results showed a downward trend for student aggression over this 14-year period. Students in China showed significantly less aggression in later years in all three regions, in middle school, and regardless of gender, supporting hypothesis H-1a and rejecting H-1b.

The result of less student aggression in later years is consistent with greater (a) awareness of others via population density or the internet, and (b) economic development driving better schooling, less poverty, or less authoritarian parenting. These results are consistent with the claims that greater population density or superior communication technology (e.g., internet) increase students' awareness of aggressions and harmful consequences, which can help students learn these links and act on them to reduce their aggression (Hilbe & Sigmund, 2010; Perc & Szolnoki, 2010; Pinker, 2012).

Likewise, less student aggression in later years is also consistent with arguments that China's economic growth drives higher schooling quality or falling family poverty (Meng, Gregory & Wang, 2005), both of which can reduce student aggression. Better schooling and student learning of appropriate behaviors might account for less student aggression (Li, 2014; Warburton & Anderson, 2015). As less family poverty can yield greater economic security among parents and reduce their economic and psychological stress, they tend to be less authoritarian, providing fewer such role models and thereby yielding less aggression by their children (Aguilar et al., 2000; Casas et al., 2006; Farrington, 2009; Joireman, Anderson, & Strathman, 2003; Lu & Chang, 2013).

The relative impact of each of these mechanisms determines the extent to which student aggression in China will fall in the future. If greater awareness of others via the internet or other media largely reduces aggression, then the exponential growth in these media augurs substantial future reductions in student aggression. If population density, economic growth, poverty reduction or less authoritarian parenting largely drives the reduction in aggression, then the slow growth (or possible reversal) of these factors suggests that student aggression will not necessarily fall much in the future. To address this issue, future studies can collect data on all of these factors and test them in the same explanatory model to determine the extent to which each of the above mechanisms contributes to less student aggression over time.

The lower aggression in later years differed across age but not across region or gender (showing no support for hypotheses H-2 and H-4). The reduction of aggression across time was much greater for junior high school students than for all other students, supporting hypothesis H-3. This result is consistent with the view that as middle-school students undergo many changes (e.g., puberty, new schools) that increase their stress and renders them more sensitive than other students to external environmental factors (Campbell et al., 2006; Casey et al., 2010; Tapper & Boulton, 2000; Toldos, 2005). As the above results suggest, the environments of students in China over time include more protective factors (population density, internet, economic growth) and fewer harmful factors (e.g., poverty's economic and psychological stressors) that together reduce students' aggressive inclinations. As middle-school students are more sensitive than other students to these environmental factors, they benefit more from them than students of other ages do.

Much of the reduction in aggression has occurred at the middle school rather than at other school levels. If this reduction in aggression across time continues according to the above mechanisms, then further substantial reduction in aggression at the middle school is likely, but not significant reduction at the elementary school or senior high school levels. These results suggest that educators seeking to reduce aggression at the elementary school or senior high school levels must consider specific interventions to do so.

5 Limitations

This study has several limitations, including survey instrument, sample participants, year estimates, time samples, and moderation variables. First, we only included studies that used the AQ by Buss and Perry (1992). Future meta-analyses can test whether these results hold for studies with other instruments, such as the Direct and Indirect Aggression Scales by Björkqvist, Lagerspetz, and Österman (1992). Second, we only included studies of students and excluded studies of adults. Future studies can test whether studies of older adults yield the same results. Third, the estimates of the year of data collection might underestimate or overestimate the actual year, which can distort our results. Researchers can increase the accuracy of future cross-temporal analyses by including the year of their data collection in their published studies. Fourth, the studies did not use representative samples of Chinese students in each year. Future studies can examine representative samples of students in China (and in other countries). Finally, this study only examined the small set of moderation variables that were available in the studies (region, age, and gender). Future studies can explore how student aggression over time differs across other factors (e.g., family structure, family socio-economic status, cognitive ability, social connectedness, threat index, etc.). These future studies can enhance our theory of aggression.

6 Conclusion

As the first study to address the controversy over changes in student aggression in China across time with a cross-temporal meta-analysis, the results of this study show that student aggression significantly decreased over time. Furthermore, this study showed that the reduction in aggression across time largely occurred among middle school students. The reduction in aggression across time did not differ across gender or across region (Eastern vs. Central vs. Western China).

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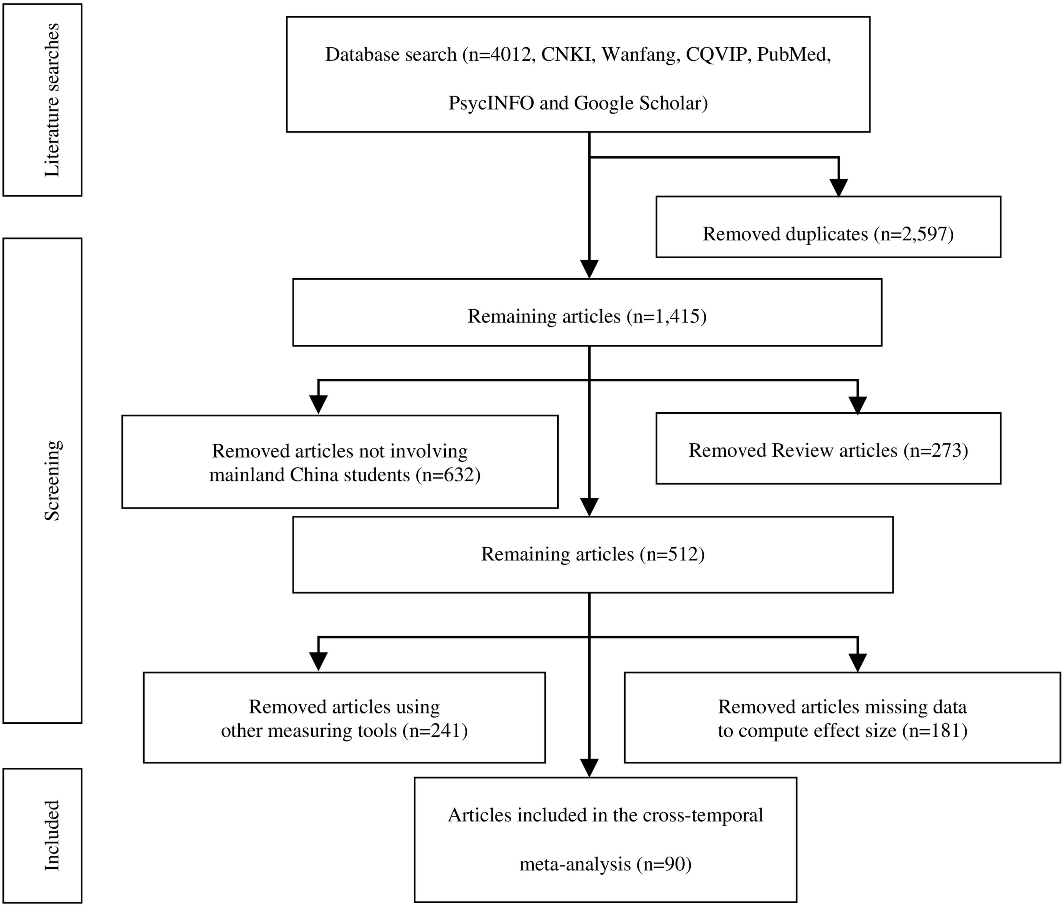
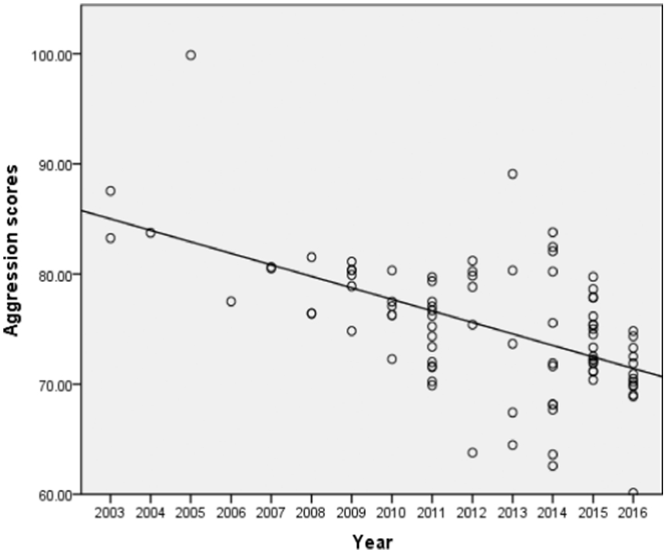
Highlights

- Adolescent aggression decreased steadily between 2003 and 2016 in China.
- Adolescent aggression in East region decreased faster than in Center and West.
- Aggression decreased faster among junior high school students than other students.
- Aggression decreased in male and female adolescents with no significant difference.



Literature searches
Screening
Included
Database search (n=4012, CNKI, Wanfang, CQVIP, PubMed, PsycINFO and Google Scholar)
Removed duplicates (n=2,597)
Remaining articles (n=1,415)
Removed articles not involving mainland China students (n=632)
Removed Review articles (n=273)
Remaining articles (n=512)
Removed articles using other measuring tools (n=241)
Removed articles missing data to compute effect size (n=181)
Articles included in the cross-temporal meta-analysis (n=90)

Figure 1



100.00
90.00
80.00
70.00
60.00
Aggression scores
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year

Figure 2