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RUNNING HEAD: SECOND- AND THIRD-PARTY PUNISHMENT

Outcomes and Intentions in Children's, Adolescents', and Adults' Second- and Third-Party
Punishment Behavior

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Abstract

Theories of morality maintain that punishment supports the emergence and maintenance of moral behavior. This study investigated developmental differences in the role of outcomes and the violator's intentions in second-party punishment (where punishers are victims of a violation) and third-party punishment (where punishers are unaffected observers of a violation). Four hundred and forty-three adults and 8-, 12-, and 15-year-olds made choices in mini-ultimatum games and newly-developed mini-third-party punishment games (MTPP), which involved actual incentives rather than hypothetical decisions. Adults integrated outcomes and intentions in their second- and third-party punishment, whereas 8-year-olds consistently based their punishment on the outcome of the violation. Adolescents integrated outcomes and intentions in second- but not third-party punishment.

Keywords: Punishment; children; adolescents; fairness; intentions

Theories of morality suggest that norms are learned and upheld through positive (e.g., praise) or negative (i.e., punishment) reinforcement (Aronfreed, 1961; Fehr & Gächter, 2002; Henrich, 2004). People punish norm violations even when this incurs material costs for themselves, both in situations where punishers were the victim of a violation (second-party punishment) and situations where punishers were unaffected third-party observers (third-party punishment; Fehr & Fischbacher, 2004).

Like adults, children punish the norm violations of others (Furman & Masters, 1980). So far, developmental research has mainly studied children's hypothetical and non-costly punishment *judgments*, but not costly punishment behavior (e.g., Leman & Björnberg, 2010; Nobes, Panagiotaki, & Pawson, 2009). Since people's judgments have been shown to strongly deviate from their actual behavior, particularly in moral contexts (Fishbein & Ajzen, 1975; Lapsley & Narvaez, 2004), hypothetical punishment judgments are unlikely to be a good indicator of costly punishment. Studying punishment behavior in tasks with tangible outcomes thus provides more valid insights into the development of moral behavior. This contributes in a novel way to our understanding of how mechanisms supporting the emergence and maintenance of morality develop over human ontogeny and bridges research on morality from different disciplines (economics, biology, psychology). This study investigated, for the first time, (i) children's, adolescents', and adults' second- and third-party punishment behavior and (ii) developmental differences in the role of outcomes and intentions for second- and third-party punishment.

The mini-ultimatum game (MUG; Falk, Fehr, & Fischbacher, 2003) assesses second-party punishment of violations of fair-sharing norms. In one-shot MUG the proposer chooses between two fixed distributions that allocate resources (typically money) to him-/herself and an anonymous responder. For example, the proposer can choose between keeping eight coins and giving two to the responder (8/2 offer) or allocating five coins each (5/5 offer). If the

responder accepts the chosen distribution, the money is allocated accordingly. If the responder rejects, both players receive nothing. Responders' rejections of positive offers have been interpreted as costly punishment, because they incur costs for both players.

Third-party punishment has been studied in (repeated) social dilemmas where cooperation norms were violated (e.g., Fehr & Gächter, 2002) and in allocations tasks where fairness norms were violated (e.g., Fehr & Fischbacher, 2004). The latter involve three persons. Person A allocates resources to Person B, who can only accept. After being informed of Person A's allocation, Person C decides whether to punish Person A by spending some of his/her own endowment: For every unit Person C spends (e.g., one coin), Person A loses two units (e.g., two coins). Punishment in this game is costly, because both Person A and Person C end up with a smaller final payoff.

Material outcomes, particularly the equality of the distribution, influence second- and third-party punishment. In ultimatum games, adults punished offers giving them less than 20% of the resources about half of the time, but they accepted equal offers (Camerer, 2003; Güth & Tietz, 1990). Six- to 10-year-old (Sally & Hill, 2006) and 9- and 12-year-old (Sutter, 2007) children also rejected unequal offers. In third-party punishment, about 60% of adults punished unequal offers (Fehr & Fischbacher, 2004). The more unequal the offer, the more adults and children punished it (Fehr & Fischbacher, 2004; Gummerum, Takezawa, & Keller, 2009). These findings resonate with research showing that from middle childhood the majority of children make equal allocations (e.g., Fehr, Bernhard, & Rockenbach, 2008; Gummerum, Keller, Takezawa, & Mata, 2008; Shaw & Olsen, 2012) and regard equal allocations as morally right in anonymous sharing situations (Keller, Gummerum, Canz, Gigerenzer, & Takezawa, 2013).

In addition to outcomes, responders' perceived intentions of violators (i.e., accidental vs. deliberate violation) influence punishment. So far, the role of intentions in punishment has

only been investigated in second-party situations (Blount, 1995; Nelson, 2002). In MUG, juxtaposing a particular distribution option available to the proposer (e.g., a 8/2 offer) with alternative offers (e.g., 5/5 or 10/0) allows for examining intention-based punishment. Adults punished an unequal 8/2 offer less when the alternative, foregone offer was 10/0 (an even more unequal offer) than when the alternative offer was an equal split, suggesting that punishment was at least partly influenced by whether the fair-sharing norm was violated intentionally or unavoidably (Falk et al., 2003).

Studies examining the role of intentions in children's and adolescents' second-party punishment produced mixed results. Sutter (2007) showed that 7- to 10-year-olds punish proposers based on intentions, but Güroğlu, van den Bos, and Crone (2009) found no evidence that 9-year-olds' punishment of identical unequal offers vary with alternative offers. Both studies concur with research on children's hypothetical punishment judgments: While preschool and elementary school children differentiated between intentional and accidental transgressions and well- and ill-intentioned actions, it is not until 10 years of age that children based their punishment judgments more strongly on violator's intentions than outcomes (Helwig, Zelazo, & Wilson, 2001; Karniol, 1978; Zelazo, Helwig, & Lau, 1996).

We used the MUG and created a new game, the mini-third-party punishment game (MTPP), to measure children's, adolescents', and adults' second- and third-party punishment. Using the MTPP made it possible to assess the role of intentions and outcomes in children's, adolescents', and adults' costly third-party punishment of unfair allocations for the first time. We expected more intention-based punishment in adolescents and adults than children. That is, adolescents and adults should be more likely than children to punish the default 8/2 offer more when the alternative offer was equal (5/5) or benefitted the receiver (2/8) than when the alternative offer was even more unfair (10/0).

Additionally, we investigated the time participants took to make their punishment decisions (i.e., response time, RT). RTs reflect the relative difficulty with which decisions are made: “Easy” or dominant decisions produce shorter RTs than complex decisions for which a person has to override his/her dominant response (Lahat et al., 2012; Rubinstein, 2007). If punishment is based on equality concerns, punishing the unequal default offer of 8/2 should be equally difficult regardless of the alternative, foregone offers. Therefore, the RTs associated with punishment of the unequal default offer (8/2) should remain constant across different alternative offers. If participants consider the violator’s intentions, punishing the 8/2 default offer when the foregone offer is even more unequal (i.e., a 10/0 offer) should be more difficult and thus associated with longer RTs than when the foregone offer is equal.

Method

Participants

Ninety-eight 8-year-olds ($M_{\text{age}} = 8.27$ years, $SD = 0.68$; 49 females), 104 12-year-olds ($M_{\text{age}} = 12.50$ years, $SD = 1.09$; 54 females), 109 15-year-olds ($M_{\text{age}} = 15.49$ years, $SD = 0.52$; 46 females), and 132 adult undergraduate students ($M_{\text{age}} = 21.76$ years, $SD = 6.07$; 104 females) participated. Minors were recruited from primary and secondary schools serving middle-class communities in southern England.

Procedure

Minors were tested in a quiet room at their school, adults in the laboratories of the authors’ university. Up to six participants were seated at separate computer terminals and entered an identification code, their date of birth, and gender. Participants received instructions for both games and were told that the points distributed in these games would be converted into money (adults) or glow sticks (minors).¹ For adults, each point was worth £0.50. Minors could earn one to five glow sticks. Participants’ final payoffs were determined

by matching one randomly selected decision in each game with the decision of an anonymous interaction partner. Participants could earn up to 15 points across the two tasks.

Participants answered two sets of quiz questions before each game (see Figure 1). MUG and MTPP were then played in counterbalanced order. Payoffs were distributed after all sessions were completed.

Materials

Mini-ultimatum game (MUG) and mini-third-party punishment game (MTPP).

The MUG is a sequential two-player game. Four subgames were presented in random order (Table 1). At Step 1, Person A decides between distribution option 1 and 2. For example, in Game[5/5], Person A was required to choose between the default Option 1 (8/2) and the alternative Option 2 (5/5). At Step 2, if Person B accepts the chosen distribution, points are distributed accordingly. If Person B rejects, neither player receives anything.

The MTPP is a sequential three-player game. At Step 1, Person A chooses between two fixed distributions for him-/herself and Person B, who can only accept. At Step 2, Person C decides whether to spend any of their endowed 5 points. For every point spent, 2 points are deducted from Person A's endowment. For example, if Person C spends 2 points, 4 points are deducted from Person A. The minimum points Person A can have is zero. Person B's payoff is not affected by Person C's decision. Four MTPP games, each with different fixed distributions at Step 1 (Table 1), were presented in random order.

About 10% of participants in each age group played the games as Persons A (8-year-olds: $n = 8$; 12-year-olds: $n = 9$; 15-year-olds: $n = 9$; adults: $n = 17$) and made four choices per game, respectively. The strategy method (Fehr & Fischbacher, 2004) was used to gain a comprehensive picture of punishers' behaviors. Punishers were shown, one-at-a-time, the distribution options within each subgame and decided whether to punish Person A, thus making eight decisions in total. For example, in Game[2/8], responders/Persons C decided

(a)

Practice Trial 1	Practice Trial 1
<p>Person A has two options!</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 1</p> <p>7 Points for → Person A ●●●●●●</p> <p>3 Points for → Person B ●●●</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 2</p> <p>3 Points for → Person A ●●●</p> <p>7 Points for → Person B ●●●●●●</p> </div> </div> <p style="text-align: center;"><input type="button" value="Next"/></p>	<p>Person A chooses this option</p> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 1</p> <p>7 Points for → Person A ●●●●●●</p> <p>3 Points for → Person B ●●●</p> </div> <div style="width: 50%;"> <p>If Person B ACCEPTS Person A's decision:</p> <p>How many points will Person A get? 0 <input type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/></p> <p>How many points will Person B get? 0 <input type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/></p> <p>If Person B REJECTS Person A's decision:</p> <p>How many points will Person A get? 0 <input type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/></p> <p>How many points will Person B get? 0 <input type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/></p> </div> </div> <p style="text-align: center;"><input type="button" value="Next"/></p>

(b)

Practice Trial 2	Practice Trial 2
<p>Person A has two options!</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 1</p> <p>4 Points for → Person A ●●●●</p> <p>6 Points for → Person B ●●●●●●</p> </div> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 2</p> <p>1 Point for → Person A ●</p> <p>9 Points for → Person B ●●●●●●●●●</p> </div> </div> <p style="text-align: center;"><input type="button" value="Next"/></p>	<p>Person A chooses this option</p> <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 5px; width: 45%;"> <p>Option 1</p> <p>4 Points for → Person A ●●●●</p> <p>6 Points for → Person B ●●●●●●</p> </div> <div style="width: 50%;"> <p>Person C has 5 points ●●●●●</p> <p>Person C decides to pay 2 points to take away points from Person A</p> <p>How many points does Person A have left? 0 <input type="checkbox"/> 4 <input type="checkbox"/> 8 <input type="checkbox"/></p> <p>How many points does Person C have left? 3 <input type="checkbox"/> 5 <input type="checkbox"/> 7 <input type="checkbox"/></p> <p>How many points does Person B have left? 4 <input type="checkbox"/> 6 <input type="checkbox"/> 8 <input type="checkbox"/></p> </div> </div> <p style="text-align: center;"><input type="button" value="Next"/></p>

Figure 1. Visual display of one set of quiz questions asked after the mini-ultimatum game (a) and mini-third-party punishment game (b) instructions. The left panels display the decision options available to Player A. Once participants press the “next” button, participants are presented with the right panels. The right panels display the option chosen by Player A. For the mini-ultimatum game, participants were then asked to indicate the correct number of points Person A and Person B would receive, if Person B accepted or rejected (a, right panel). For the mini-third-party punishment game, participants were presented with an example punishment decision of Person C and had to indicate the correct number of points for Persons A, B, and C Person B (b, right panel). Incorrect answers received an automatic prompt. After three such prompts participants received further instructions.

whether to punish the chosen offer of 8/2 when the foregone alternative was 2/8 and whether to punish the chosen offer of 2/8 when the foregone alternative was 8/2.

Response-time measures. RTs were measured from the moment Person A's decision was shown until the responder/Person C responded.

Table 1

Structure of Mini-Ultimatum Games and Step 1 of Mini-Third-Party Punishment Games

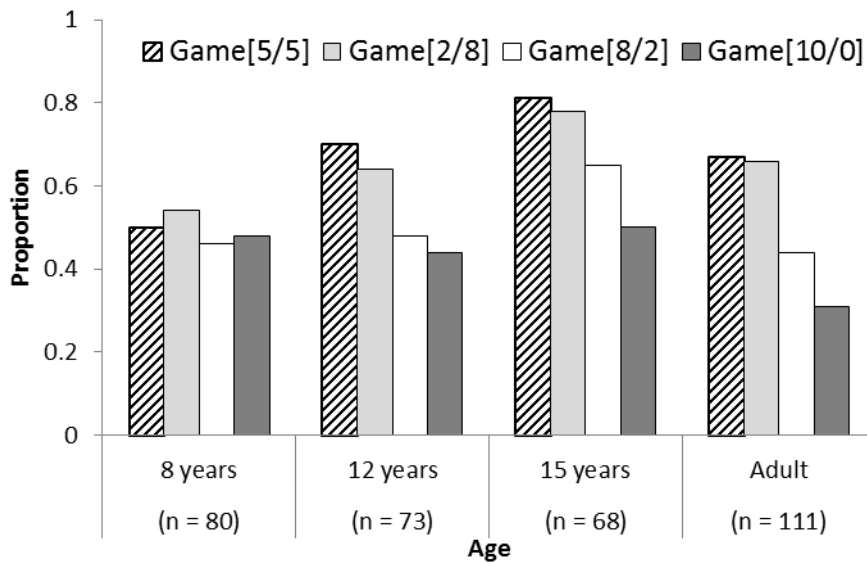
Subgame	Distribution options presented to Person A (points for Person A/points for Person B)	
	Option 1	Option 2
Game[10/0]	8/2	10/0
Game[8/2]	8/2	8/2
Game[5/5]	8/2	5/5
Game[2/8]	8/2	2/8

Results

Analyses included only responders/Persons C who answered all quiz questions correctly (see Figures 2, 3 for *ns*). Preliminary analyses showed no significant gender effects.

Concerning the punishment of the default 8/2 offer in MUG, a significant interaction effect of Game \times Age emerged, $F(9, 332) = 2.54, p = .008, \eta_p^2 = .03$, which was followed up by repeated-measures ANOVAs separately for each age group. Adults, $F(3, 111) = 20.58, p < .001, \eta_p^2 = .16$, 15-year-olds, $F(3, 81) = 9.77, p < .001, \eta_p^2 = .13$, and 12-year-olds, $F(3, 73) = 6.35, p < .001, \eta_p^2 = .08$, punished the 8/2 default more often in Game[5/5] and Game[2/8] than in Game[10/0] (all $ps < .01$). Twelve-year-olds and adults punished the default offer

a)



(b)

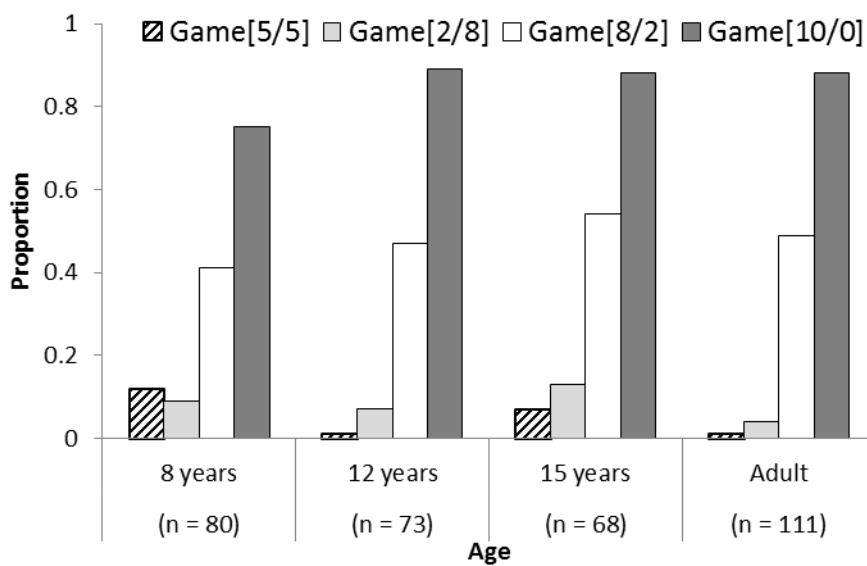


Figure 2. Proportion of second-party punishment of the default offer 8/2 (a) and the alternative offers (b) in the mini-ultimatum game by subgame and age.

more in Game[5/5] than Game[2/8] (all $ps < .01$). Eight-year-olds punished the default offer to an equal degree across games (Figure 2a). Across ages, the default offer was punished significantly more often when the foregone offer was either 5/5 or 2/8 than when the

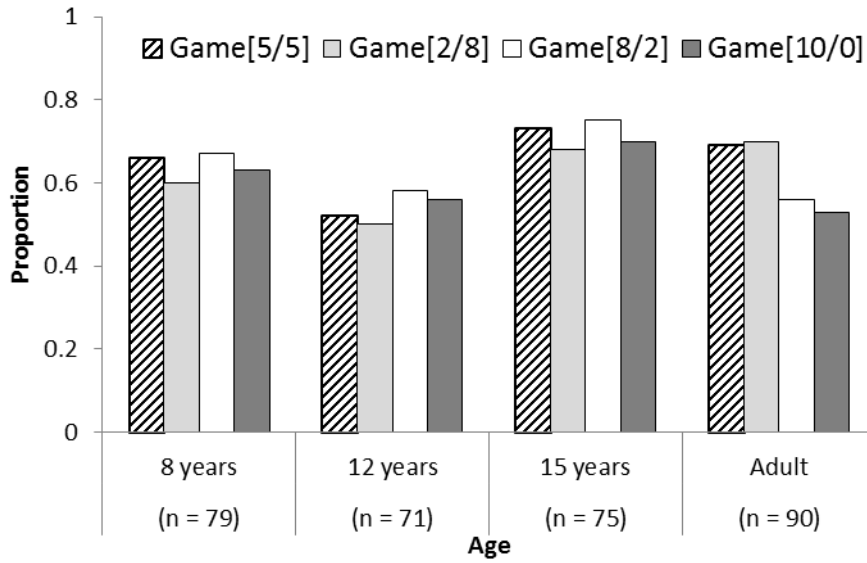
foregone offer was either 10/0 or 8/2, $F(3, 332) = 26.46, p < .001, \eta_p^2 = .08$. Fifteen-year-olds punished the default offer more than participants of all other ages, $F(3, 332) = 4.87, p = .003, \eta_p^2 = .04$. Concerning alternative offers, participants of all ages punished equal offers of 5/5 and offers of 2/8 less than 8/2 and 10/0 offers, and 8/2 offers less than 10/0 offers, $F(3, 332) = 331.66, p < .001, \eta_p^2 = .51$ (Figure 2b).

Concerning third-party punishment, we first assessed whether Persons C punished at all thereby treating responses as dichotomous (punishment, no punishment). A significant interaction effect of Game \times Age emerged, $F(9, 315) = 2.00, p = .04, \eta_p^2 = .02$. Separate repeated-measures ANOVAs showed that punishment of the default offer did not differ across games for the 8-, 12-, and 15-year-olds. Adults punished the default offer significantly more often when the foregone alternative was either 5/5 or 2/8 than when it was 10/0, $F(3, 90) = 5.92, p = .001, \eta_p^2 = .06$ (Figure 3a). Twelve-year-olds punished the default offer 8/2 significantly less than all other age groups, $F(3, 315) = 3.76, p = .01, \eta_p^2 = .03$. Concerning alternative offers, across ages participants punished offers of 5/5 less than 2/8 offers, and 2/8 offers less than 10/0 or 8/2 offers, $F(3, 315) = 47.41, p < .001, \eta_p^2 = .13$ (Figure 3b).

Second, we examined how many points (0 to 5) Persons C spent to punish.

Concerning the points invested to punish the 8/2 default offer, no significant effects with the variable game were found. Twelve-year-olds invested significantly fewer points than 8- and 15-year-olds and adults, $F(3, 315) = 8.34, p = .0001, \eta_p^2 = .08$. For alternative offers, the number of points invested differed significantly across games in all ages, with offers of 10/0 receiving the largest and offers of 2/8 receiving the lowest amount of punishment, $F(3, 315) = 100.87, p < .001, \eta^2 = .25$ (Table 2). Twelve-year-olds invested significantly fewer points to punish alternative offers than 8- and 15-year-olds and adults, $F(3, 315) = 10.49, p = .0001, \eta^2 = .09$.

(a)



(b)

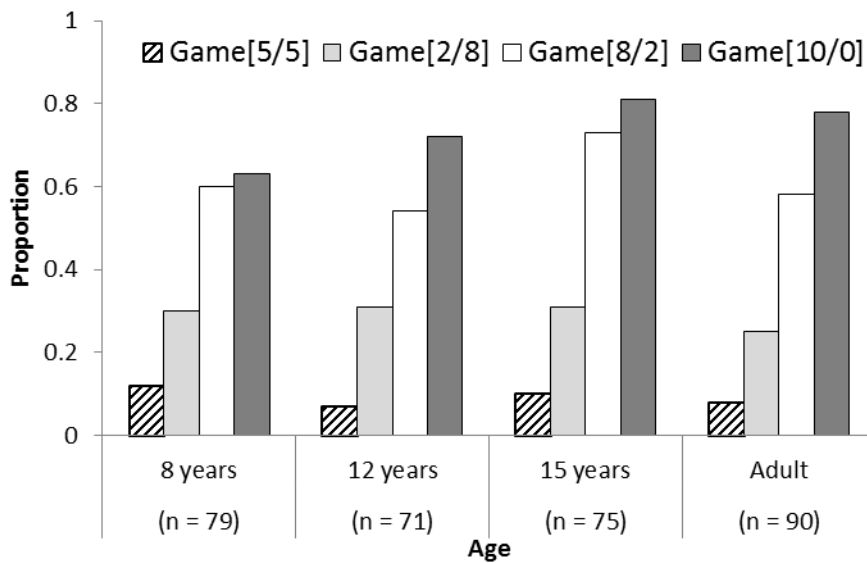


Figure 3. Proportion of third-party punishment of the default offer 8/2 (a) and the alternative offers (b) in the mini-third-party punishment game by subgame and age.

We also examined different individual behavior patterns in MUG and MTPP. Table 3 shows the number of participants who only sanctioned zero offers, but did not punish positive offers (“punish selfishness”), participants who punished offers that gave Person B less than

Table 2

Mean (and SD) Number of Points Invested by Person C to Punish Person A in Mini-Third-Party Punishment Game by Game and Age

Game	Points invested in mini-third-party punishment game			
	8 years	12 years	15 years	Adult
Default offer 8/2				
Game[10/0]	1.65 (1.68)	0.96 (1.05)	1.76 (1.41)	1.17 (1.21)
Game[8/2]	1.52 (1.53)	1.06 (1.19)	1.85 (1.37)	1.20 (1.33)
Game[5/5]	1.56 (1.61)	1.00 (1.11)	1.75 (1.37)	1.55 (1.34)
Game[2/8]	1.73 (1.66)	1.12 (0.89)	1.60 (1.31)	1.33 (1.23)
Alternative offer				
Game[10/0]	2.11 (1.99) _a	1.46 (1.34) _a	2.45 (1.85) _a	2.13 (1.67) _a
Game[8/2]	1.57 (1.67) _b	0.89 (0.99) _b	1.71 (1.30) _b	1.29 (1.33) _b
Game[5/5]	1.32 (1.60) _c	0.46 (1.00) _c	0.69 (0.97) _c	0.40 (0.72) _c
Game[2/8]	0.73 (1.05) _d	0.42 (0.77) _c	0.55 (1.00) _c	0.34 (0.64) _c

^{abcd} Means in columns *not followed* by a common letter subscript differ at $p < .01$ (columnwise comparison; repeated-measures Analysis of Variance conducted separately for each age group).

half but did not punish equal or advantageous offers (“punish inequality”), participants who only punished A when s/he forewent a kinder offer to B for a less generous one (“punish intentions”), and participants who always punished Person A. In MUG, children and adolescents punished inequality marginally more often than adults, $\chi^2(3) = 6.55, p = .09$.

Fifteen-year-olds and adults punished intentions significantly more often than 9- and 12-year-olds, $\chi^2(3) = 16.03, p = .001$. No developmental differences emerged for the other patterns. In MTTP, adults punished intentions significantly more frequently than children and

adolescents, $\chi^2(3) = 7.84, p=.049$. Children and adolescents punished selfishness marginally more often than adults, $\chi^2(3) = 7.32, p =.06$. No other developmental differences emerged.

Table 3

Frequencies (and Percent) of Individual Patterns of Punishment Behavior by Game and Age

Pattern	Mini-ultimatum game				Mini-third-party punishment game			
	8 years <i>n</i> = 37	12 years <i>n</i> = 36	15 years <i>n</i> = 43	Adult <i>n</i> = 56	8 years <i>n</i> = 30	12 years <i>n</i> = 28	15 years <i>n</i> = 29	Adult <i>n</i> = 28
Punish selfishness	11 (34%)	6 (18%)	4 (10%)	8 (15%)	10 (46%)	7 (30%)	8 (36%)	1 (5%)
Punish inequality	16 (50%)	15 (44%)	19 (48%)	14 (25%)	8 (41%)	11 (48%)	13 (59%)	11 (50%)
Punish intentions	5 (16%)	13 (38%)	17 (43%)	32 (60%)	3 (25%)	5 (22%)	1 (5%)	10 (45%)
Always punish	5 (14%)	2 (6%)	3 (7%)	2 (4%)	9 (30%)	7 (18%)	7 (24%)	6 (21%)

For each age group, separate repeated-measures ANOVAs were conducted on the mean RTs associated with the decision to punish the default offer in MUG. Among 8-year-olds, RTs did not differ significantly between games. RTs in game [10/0] were longer than in Game [5/5] in both 15-year-olds, $F(3, 81) = 2.85, p=.04, \eta_p^2 = .04$ and adults, $F(3, 115) = 3.29, p=.02, \eta_p^2 = .04$. RTs of 12-year-olds showed a similar pattern although this difference was only marginally significant, $F(3, 78) = 2.12, p=.08, \eta_p^2 = .03$ (Table 4).

RTs associated with Person C's decision to punish the default offer in MTPP did not differ across games for 8- and 15-year-olds. Among 12-year-olds, Person C's punishment decision was associated with significantly longer RTs in Game[10/0] and Game[8/2] than in Game[5/5], $F(3, 71) = 3.24, p = .02, \eta^2 = .04$. For adults, longer RTs emerged in Game[10/0] than in Game[5/5], $F(3, 89) = 4.81, p = .003, \eta^2 = .05$ (Table 4).

Table 4

Mean Response Times (and SDs) Associated with the Punishment of the Default Offer 8/2 in the Mini-Ultimatum Game and the Mini-Third-Party Punishment Game by Subgame and Age (in Milliseconds)

Subgame	Age			
	8 years	12 years	15 years	Adult
Mini-ultimatum game				
Game[10/0]	12,490 (8,657) _a	8,031 (5,918) _a	8,880 (7,659) _a	8,153 (5,082) _a
Game[8/2]	13,289 (11,679) _a	7,524 (4,522) _a	7,528 (4,219) _{a,b}	7,699 (4,742) _{a,b}
Game[5/5]	10,704 (8,696) _a	6,364 (4,162) _a	6,311 (3,202) _{a,b}	6,674 (3,892) _{a,b}
Game[2/8]	12,067 (7,081) _a	7,870 (4,966) _a	7,507 (5,134) _b	7,887 (5,641) _b
Mini-third-party punishment game				
Game[10/0]	14,731 (10,107) _c	10,262 (6,724) _c	9,695 (6,710) _c	10,318 (5,337) _c
Game[8/2]	14,546 (11,669) _c	10,476 (6,954) _c	9,338 (4,794) _c	10,793 (9,471) _{c,d}
Game[5/5]	12,909 (7,794) _c	7,709 (4,043) _{c,d}	8,019 (4,394) _c	7,831 (4,131) _{c,d}
Game[2/8]	15,903 (11,818) _c	9,629 (7,138) _d	9,155 (4,892) _c	9,968 (6,029) _d

^{abcd} Means in columns *not followed* by a common letter subscript differ at $p < .05$ (columnwise comparison; repeated-measures Analysis of Variance conducted separately for each age group).

Discussion

Consistent with earlier research (e.g., Falk et al., 2003; Güroğlu et al., 2009; Sutter, 2007), adults' and adolescents' second-party punishment in MUG was influenced by both concerns for outcomes and intentions: Although they punished unequal disadvantageous offers more than equal and advantageous offers, the default unequal 8/2 offer was punished less when the alternative foregone offer was as or more unequal than when it was equal or advantageous to the responder. Analyses of RTs showed that it was particularly hard for adults, 15-year-olds, and (marginally) 12-year-olds to decide whether to punish the 8/2 default offer in Game[10/0], probably because choosing the unequal 8/2 offer in this game actually reflected the proposer's friendly intentions. This pattern was not observed in 8-year-olds. Thus, adolescents and adults were more likely to administer intention-based punishment than children.

This is the first study that assessed the role of intentions and outcomes in costly third-party punishment. Interventions on behalf of third parties are unlikely to be motivated by self-interest and thus show people's commitment to norms (Vaish, Missana, & Tomasello, 2011). Adults integrated Person A's intentions and the fairness of the distribution in third-party punishment. However, adults were more likely to punish inequality and less likely to punish intentions in third- compared to second-party situations. Furthermore, the amount of points adults spent punishing the default offer in MTPP did not differ with the foregone alternative. Children's and adolescents' third-party punishment was mainly based on the equality of the distribution rather than Person A's intentions.

What can account for these developmental and task differences in the influence of intentions on punishment? Radke, Güroğlu, and de Bruijn (2012) proposed a two-stage developmental model of decision-making in fairness situations. At Stage 1, fairness is

conceptualized as inequity aversion and is based on social comparisons between one's own and others' outcomes. At Stage 2, people consider additional contextual information (e.g., intentionality) when pondering the fairness of a decision. This requires cognitive competencies, such as counterfactual reasoning, executive functions, and mind-reading abilities, which develop from childhood to adolescence (Apperly, 2013; Choudhury, Blakemore, & Charman, 2006; Zelazo, Craik, & Booth, 2004). These advanced cognitive abilities allow adults and adolescents, but not children, to incorporate intentionality information in their punishment.

Why, then, are adolescents and adults more likely to consider the violators' intentions in second- but not third-party punishment? First, integrating intentions into one's third-party punishment requires punishers to simultaneously consider multiple perspectives from a third-person point of view, an ability that emerges in mid-adolescence (Selman, 1980). Second, even when adolescents and adults have developed advanced perspective-taking skills, they struggle with employing these abilities for (sometimes routine) actions and decisions (Dumontheil, Apperly, & Blakemore, 2010; Keysar, Lin, & Barr, 2003). Lin, Keysar and Epley (2010) showed that while adults had no difficulties in understanding others' mental states, utilizing this knowledge in decision-making was effortful.

While previous research has mainly focused on people's punishment choices, this study additionally assessed RTs to study the underlying cognitive processes involved in punishment. The RT results indicate that even when the relevant cognitive abilities are at adult level, making intent-based punishment decisions was still effortful when outcome-information conflicted with intention-information in Game[10/0]. RTs associated with punishing the 8/2 default offer in MTPP suggest that 12-year-olds take into account the violator's intentions, whereas the analyses of their punishment decisions show that they do not consider intentions. These findings suggest a developmental lag between understanding

the role of intentions in punishment and actually administering intent-based punishment, probably because of the cognitive demands involved in intent-based punishment. They also highlight the importance of studying the development of punishment judgments, behavior and the processes underlying people's decisions.

In sum, because integrating intentions is more cognitively effortful and requires more advanced perspective-taking abilities in third- than second-party punishment, adolescents and adults might be less likely to consider intentions in the former than the latter situations. In future research, punishers could be asked to perform a concurrent second task that draws on advanced perspective-taking skills. This should lead to more outcome-based and less intention-based punishment even in adults (Lin et al., 2010).

We found age effects in participants' second- and third-party punishment, which converge, to some extent, with earlier research on adolescents' punishment (Güroğlu et al., 2009; Sutter, 2007). Specifically, 15-year-olds might be more likely to punish unequal offers, because, more than younger and older participants, they compare themselves and their payoffs to others and therefore are more attuned to equal outcomes (Dusek & McIntyre, 2003). Whereas an increasing number of studies have examined the early emergence of fairness in young children (e.g., Warneken, Lohse, Melis, & Tomasello; 2011), developmental psychological research on these concepts in adolescence is rather sparse. Therefore, a fruitful endeavor for future research would be to follow research in experimental economics (e.g., Martinsson, Nordbloom, Rützler, & Sutter, 2011; Sutter & Kocher, 2007) and examine fairness concerns, their relation to punishment decisions, and the developmental abilities underlying fairness and punishment across ontogeny.

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Footnotes

¹ Due to concerns by the university's ethics committee as well as some participating schools, money could not be used as payment for minors. In addition to the analyses reported here, we conducted analyses separately for the adults and the minor samples, available upon request from the first author.