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When Punishment is Emotion-Driven: Children's, Adolescents', and Adults' Costly Punishment of Unfair Allocations

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Social Development

Wiley

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Appendix A

Instructions for child and adolescent participants

Brief

Thank you for taking part in our research project. My/our names are X and we are from the University of XX. We have come to your school because we are interested in finding out how students make decisions about dividing things between people.

You will take part in one task, in which you will make seven decisions on the computer about how to split points between yourself and other people. The other people do not know who you are, and you don't know who they are.

After you made the decisions, we will ask how you felt about each decision. You will also have to write down your date of birth and gender. All tasks and questionnaires will be on the computer.

Throughout the study, skin conductance will be registered. This procedure measures changes in your emotions. When we are excited about things our fingers start to sweat. We will attach sensors to the index and middle finger of one of your hands. These sensors measure whether your fingers are sweating or not and therefore whether you are excited or not.

All the decisions will be about dividing some points between you and other people, so everyone will have different number of points at the end. These points will be exchanged for gifts – these special USB sticks. I will explain more about this in a minute.

Only the researchers at the university will know what your answers are. No other people will know what decisions you have made in these tasks and what your answers are. Only us, not your friends, not your teachers, not even your parents will know your answers. So please answer the questions in these tasks honestly.

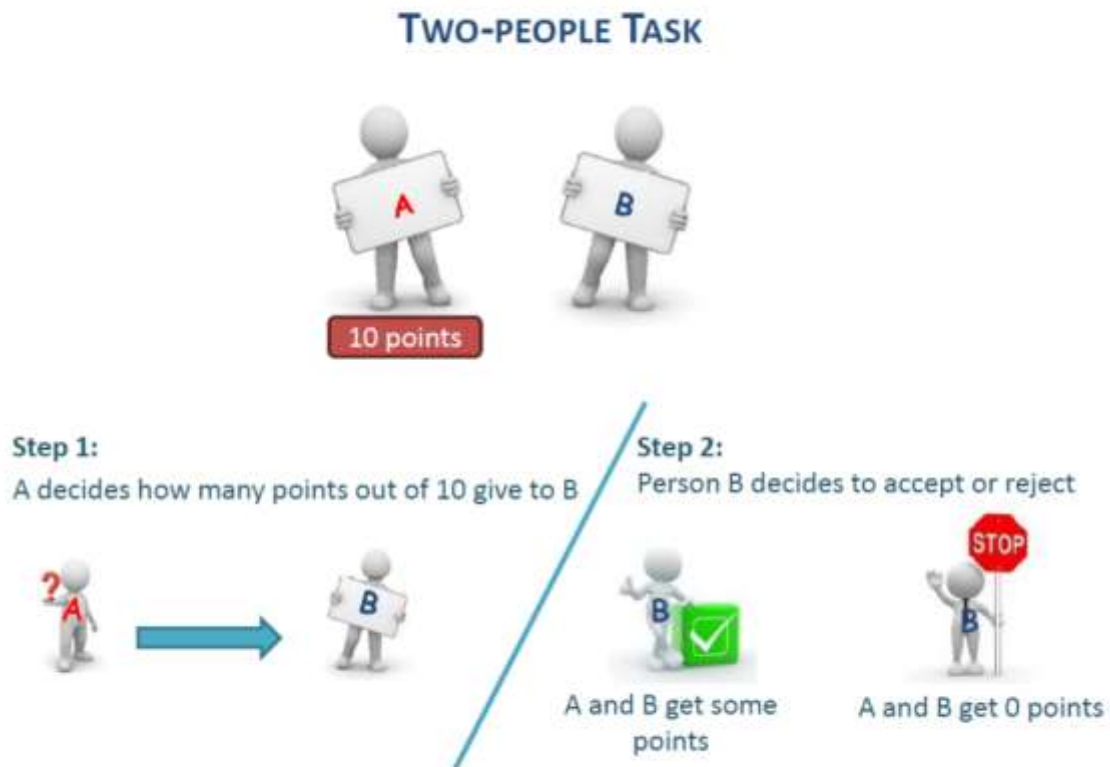
If for any reason you would not like to take part, or if you would like to stop half way through. That is fine. Just let me know.

Study 1: Ultimatum Game Instructions

I am going to explain to you what you will do in this session. Please listen carefully, and please do not talk to other pupils until the end of the session. If you have any questions, please raise your hand and I will come help you out.

This task is called the two-people task. You and another person will make decisions. We call the two people that do this task together Person A and Person B. You will be Person B, and the other person will be Person A. We can't tell you who Person A is, and Person A does not know who you are. He or she could be from your school or from another school, and could be a boy or a girl.

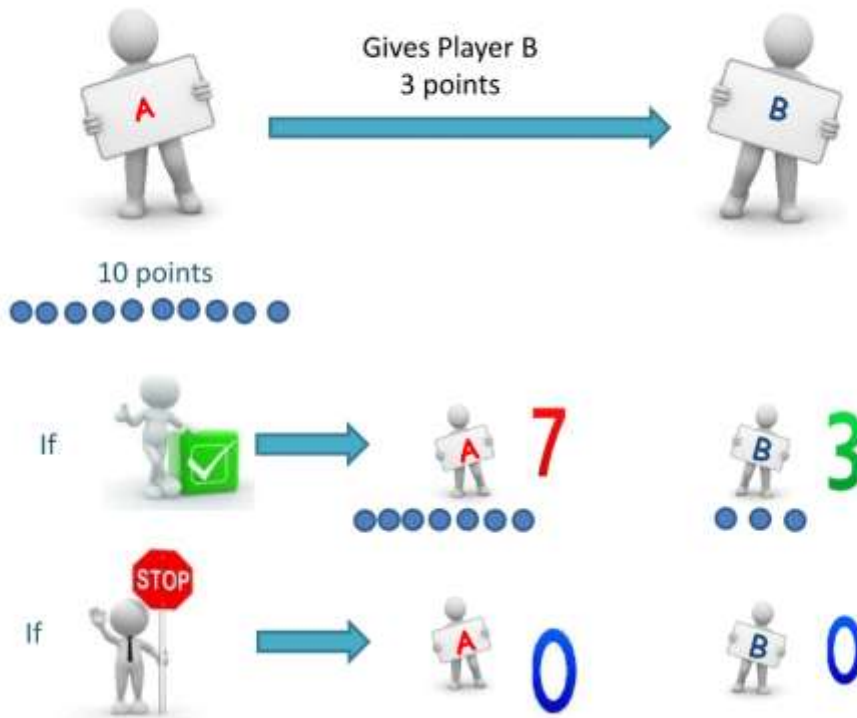
In this task, Person A will first make a decision about how to divide some points between themselves and you.



First, Person A has 10 points. He or she can decide how many out of these 10 points to give to Person B. Next, it is Person B's time to decide. Person B can decide to accept the points that Person A gives him or her. If Person B accepts, then Person A and B divide the points how Person A decided. However, Person B can also decide to reject Person A's division. If Person B rejects, then A and B do not get any points.

Let me give you an example

EXAMPLE TWO-PEOPLE TASK



Here Person A has 10 points and decides to give Person B 3 out of the 10 points. What happens when Person B accepts the 3 points? Yes, Person B then has 3 points, and Person A has 7 points. What happens when Person B rejects? Nobody gets any points – both Person A and Person B have 0 points.



Now let's try an example.....



Quiz 1: Please look at this example. Person A decides to give Person B 5 out of the 10 points. Can you find out what happens when Person B accepts Person A's decisions? Can you find out what happens when Person B rejects Person A's decision?

<p>Person A gives Person B 5 points out of a total of 10 points</p>	<p><u>Quiz 1</u></p> <p><u>If</u> <u>Accepts:</u></p> <p>Person will get <u>?</u> <u>?</u> points</p> <p>Person will get <u>?</u> <u>?</u> points</p> <p><u>If</u> <u>rejects</u></p> <p>Person will get <u>?</u> <u>?</u> points</p> <p>Person will get <u>?</u> <u>?</u> points</p>
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Quiz 2: Let's look at another example. Person A decides to give Person B 6 out of the 10 points. Can you find out what happens when Person B accepts Person A's decisions? Can you find out what happens when Person B rejects Person A's decision?



Top tip! Remember if person B rejects both players will get 0 points.

Quiz 1

Person A offers Person B:

6 points out of 10

If Person B accepts:

Person A will get point(s).

and

Person B will get point(s).

If Person B rejects:

Person A will get point(s).

and

Person B will get point(s).

Next

Excellent. In a minute you will do the task on the computer. You will read about the different decisions that Person A has made. Your job is to decide whether to accept or reject Person A's decision. As you now know already, if you accept Person A's decision you and Person A will get the number of points in the option Person A has chosen. If you reject Person A's decision then neither of you gets any points, that is, you will both get 0 points. You will make 7 decisions in this task. It's up to you whether you would like to accept or reject Person A's decision. There are no right or wrong answers.

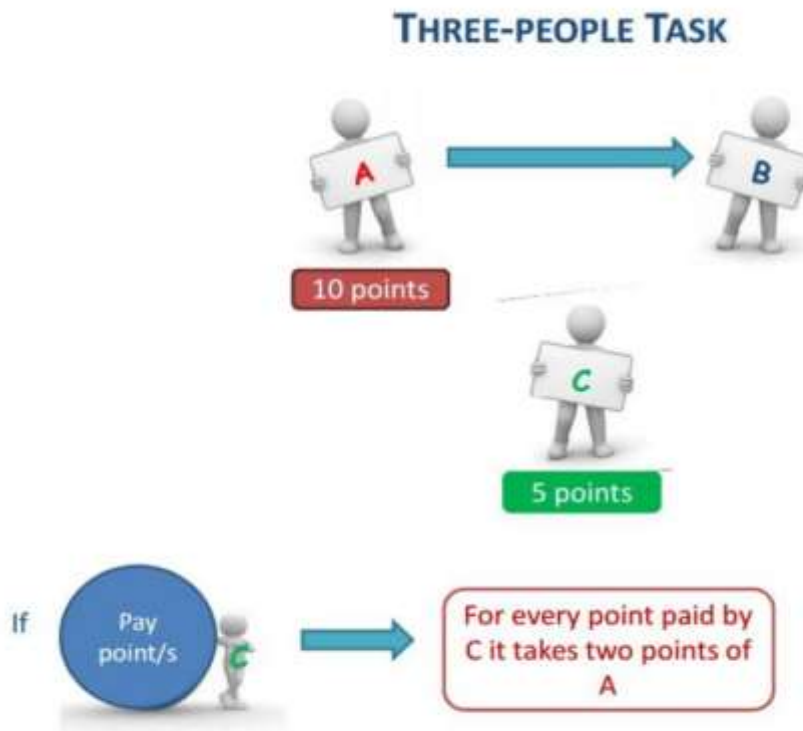
As I mentioned earlier, the points you make in the task will be exchanged for gifts – we have some really special and different types of USB sticks here. After all students have completed the tasks, the computer will randomly pick out one of the decisions you've made today and we will match it with another student's decision. The points you will have at the end depends on the options Person A has chosen and also whether you have accepted or rejected it. The more points you have, the more likely you are to pick the USB stick that you like the most.

Study 2: Third-party Punishment Game Instructions

I am going to explain to you what you will do in this session. Please listen carefully, and please do not talk to other pupils until the end of the session. If you have any questions, please raise your hand and I will come help you out.

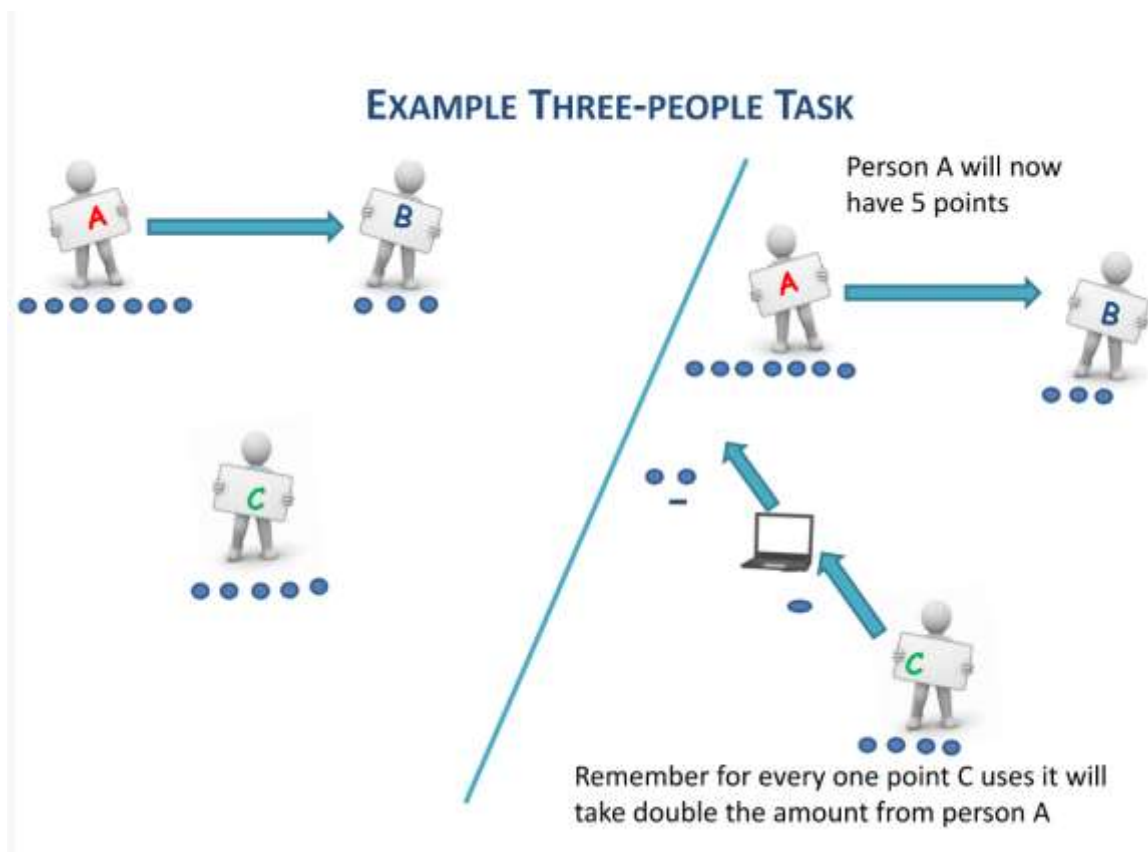
This task is called the three-people task. You will make decisions together with two other people. We call the three people in this task Person A, Person B, and Person C. You will be Person C, and the other two people will be Person A and Person B. We can't tell you who they are, and they don't know who you are. They could be from your school or from another school, and could be boys or girls.

In this task, Person A will first make a decision about how to divide some points between themselves and Person B.



First, Person A has 10 points. He or she can decide how many out of these 10 points to give to Person B. Person B can only accept the points that Person A gives him or her. Next, it is Person C's time to decide. Person C has 5 points. Person C can decide whether to pay any of his/her 5 points to take away points from Person A. For every 1 point that Person C pays, 2 points are taken away from Person A.

Let me give you an example



Here Person A has 10 points and decides to give Person B 3 out of the 10 points. This means Person A has now 7 points, and Person B has 3 points.

Person C has 5 points. What happens if Person C decides to pay no (zero) points? Person A keeps 7 points, Person B keeps 3 points, and Person C keeps 5 points.

What happens, if Person C decides to pay 1 point? How many points does Person C have left? Yes, 4 points. How many points does Person A have left, after Person C pays 1 point? Person A loses the double the amount of points, namely 2 points (2×1 points). How many points does Person A have left then? Yes, 7 minus 2 points, namely 5 points.

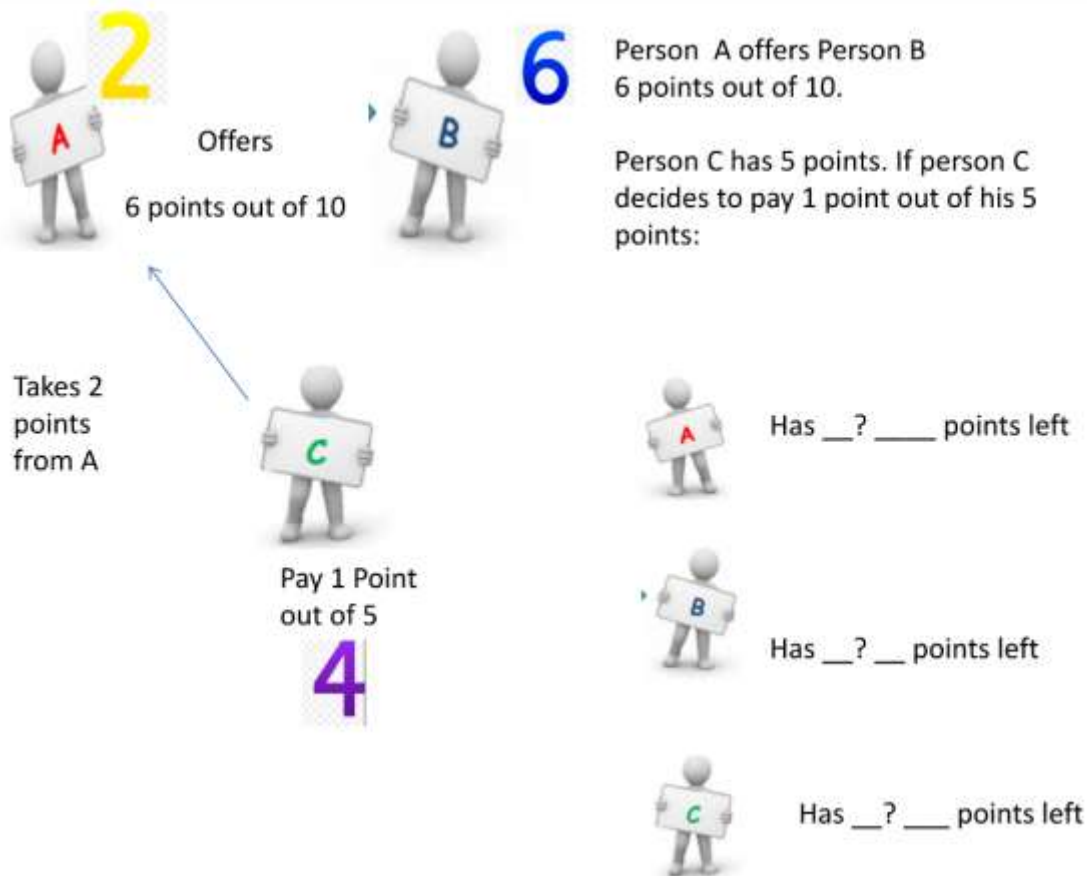
What happens to Person B's points, if Person C decides to pay 1 point? Person B's points stay like they are. Person B keeps his/her 3 points.



Let's try an example...



Quiz 1: Please look at this example. Person A decides to give Person B 6 out of the 10 points.
Can you find out what happens to Person A's points if Person C decides to pay 1 point?
Can you find out what happens to Person B's points if Person C decides to pay 1 point?
Can you find out what happens to Person C's points if Person C decides to pay 1 point?



Quiz 2: Let's look at another example. Person A decides to give Person B 7 out of the 10 points. Can you find out what happens when Person B accepts Person A's decision? Can you find out what happens when Person B rejects Person A's decision? Can you find out what happens to Person A's points if Person C decides to pay 1 point? Can you find out what happens to Person B's points if Person C decides to pay 1 point? Can you find out what happens to Person C's points if Person C decides to pay 1 point?




Top tip! Remember the number of points **doubles** when it's taken away from A, 1 point from Person C take 2 points from Person A
Quiz 1


Person C has 5 points


If Person C decides to pay 1 point out of his 5 points:


Person A offers Person B:

7 points out of 10

Person A has point(s) left. 

Person B has point(s) left. 

Person C has point(s) left. 

 Top tip! Start with person C, then person B then Person A

Excellent. In a minute you will do the task on the computer. You will read about the different decisions that Person A has made. Your job is to decide whether to keep the 5 points you have all to yourself, or to pay some or all of them so that some of Person A's points will be taken away. Remember, the computer will take away double the amount of points you pay from Person A. So the more points you pay, the more points Person A will lose. But whether you pay your points will not affect Person B. Person B will have the same number of points that Person A chooses to give them.

As I mentioned earlier, the points you make in the task will be exchanged for gifts – we have some really special and different types of USB sticks here. After all students have completed the tasks, the computer will randomly pick out one of the decisions you've made today and we will match it with another student's decision. The points you will have at the end depends on the options Person A has chosen and also whether you have accepted or rejected it. The more points you have, the more likely you are to pick you're the USB stick that you like the most.

Table S1

Mean (and SDs) Allocation Decisions by Person A in the Ultimatum Games (Study 1) and Third-party Punishment Game (Study 2) by Age Group

	Study 1:	Study 2:
	Person A's allocation decisions in the Ultimatum Game	Person A's allocation decisions in the Third- party Punishment Game
Children	3.71 (2.61)	5.65 (2.68)
Adolescents	4.65 (1.35)	3.74 (1.60)
Adults	4.68 (.69)	4.89 (.65)

Table S2

Estimates (Standard Errors) of Fixed Effects and Goodness-of-Fit Statistics of Person A's Allocation Decisions in Study 1 (Ultimatum Game) and Study 2 (Third-party Punishment Game).

	Study 1: Person As' allocation decision in Ultimatum Game	Study 2: Person As' allocation decision in Third-party Punishment Game
Intercept	4.84 (.21)**	4.39 (.10)**
Age group	-.49 (.09)**	.07 (.08)
BIC	1793.84	18301.33
Log Likelihood	-883.54	-9164.07
Number of observations	805	812
Variance: ID	3.52	6.06

** $p < .01$;

Table S3

Sequential Coding of the Moderator Age Group in the Moderated Mediation Analyses.

Age Group	Sequential coding	
	D ₁	D ₂
Children	0	0
Adolescents	1	0
Adults	1	1

Table S3

Study 1: Regression Coefficients (Standard Errors) with Confidence Intervals Estimating Galvanic Skin Responses (GSR) and Punishment in Ultimatum Game.

	Emotion ratings (<i>M</i>)			Punishment in Ultimatum Game (<i>Y</i>)		
		Coefficient	95% CI		Coefficient	95% CI
Offer (<i>X</i>)	a ₁	-.04 (.02)	-.08, .01	c'	.75 (.06)**	.64, .86
GSR (<i>M</i>)				b ₁	-1.35 (.30)**	-1.93, -.77
Age group D1 (<i>W</i> 1)	a ₂	-.33 (.10)*	-.53, -.13	b ₂	-.71 (.23)**	-1.16, -.26
Age group D2 (<i>W</i> 2)	a ₃	.14 (.10)	-.05, .34	b ₃	1.12 (.22)**	.69, 1.55
XW1	a ₄	.06 (.03)*	.01, .11			
XW2	a ₅	-.05 (.03)	-.10, .01			
MW1				b ₄	.42 (.36)	-.30, 1.13
MW2				b ₅	-.27 (.52)	-1.29, .74
Constant		.27 (.07)**	.12, .41		-2.38 (.32)	-3.02, -1.75
$R^2 = .14, F(5, 795) = 3.31, p = .006$				CoxSnell $R^2 = .35$		
Log Likelihood = 758.96, df = 6, p < .01						

Table S5

Study 1: Regression Coefficients (Standard Errors) with Confidence Intervals Estimating Emotion Ratings and Punishment in Ultimatum Game.

	Emotion ratings (<i>M</i>)			Punishment in Ultimatum Game (<i>Y</i>)		
		Coefficient	95% CI		Coefficient	95% CI
Offer (<i>X</i>)	a_1	.59 (.05)**	.49, .68	c'	.51 (.06)**	.39, .62
Emotion ratings (<i>M</i>)				b_1	.29 (.07)**	.13, .41
Age group D1 (<i>W1</i>)	a_2	-.32 (.23)	-.77, .14	b_2	-1.46 (.52)**	-2.47, -.44
Age group D2 (<i>W2</i>)	a_3	.02 (.22)	-.42, .46	b_3	1.62 (.55)**	.55, 2.69
XW1	a_4	-.02 (.06)	-.15, .10			
XW2	a_5	.10 (.06)	-.02, .22			
MW1				b_4	.32 (.14)*	.06, .59
MW2				b_5	-.19 (.15)	-.49, .11
Constant		1.89 (.17)**	1.55, 2.22		-2.38 (.32)	-3.02, -1.75
$R^2 = .64, F(5, 799) = 111.23, p < .01$				CoxSnell $R^2 = .35$		
				Log Likelihood = 769.32, df = 6, p < .01		

Table S6

Study 2: Estimates (Standard Errors) of Fixed Effects and Goodness-of-Fit Statistics of the Predicted Models Predicting Participants' Galvanic Skin Responses and Emotion Ratings in the Third-party Punishment Game.

	Galvanic Skin Responses	Emotion ratings
Intercept	-.14 (1.50)	3.46 (.29)**
Age group	.16 (.74)	-.06 (.15)
Offer	.13 (.30)	.31 (.06)**
Binary Punishment	1.16 (1.65)	-.54 (.30)
Binary Punishment x Offer	-.10 (.36)	.03 (.07)
Binary Punishment x Age Group	-.43 (.80)	-.28 (.14) [†]
BIC	5821	3095.72
Log Likelihood	-2880.65	-1517.71
Number of observations	812	812
Variance: ID	7.87	.71
Variance: Offer	.00	.003

** $p < .01$; [†] $p < .10$

Table S7

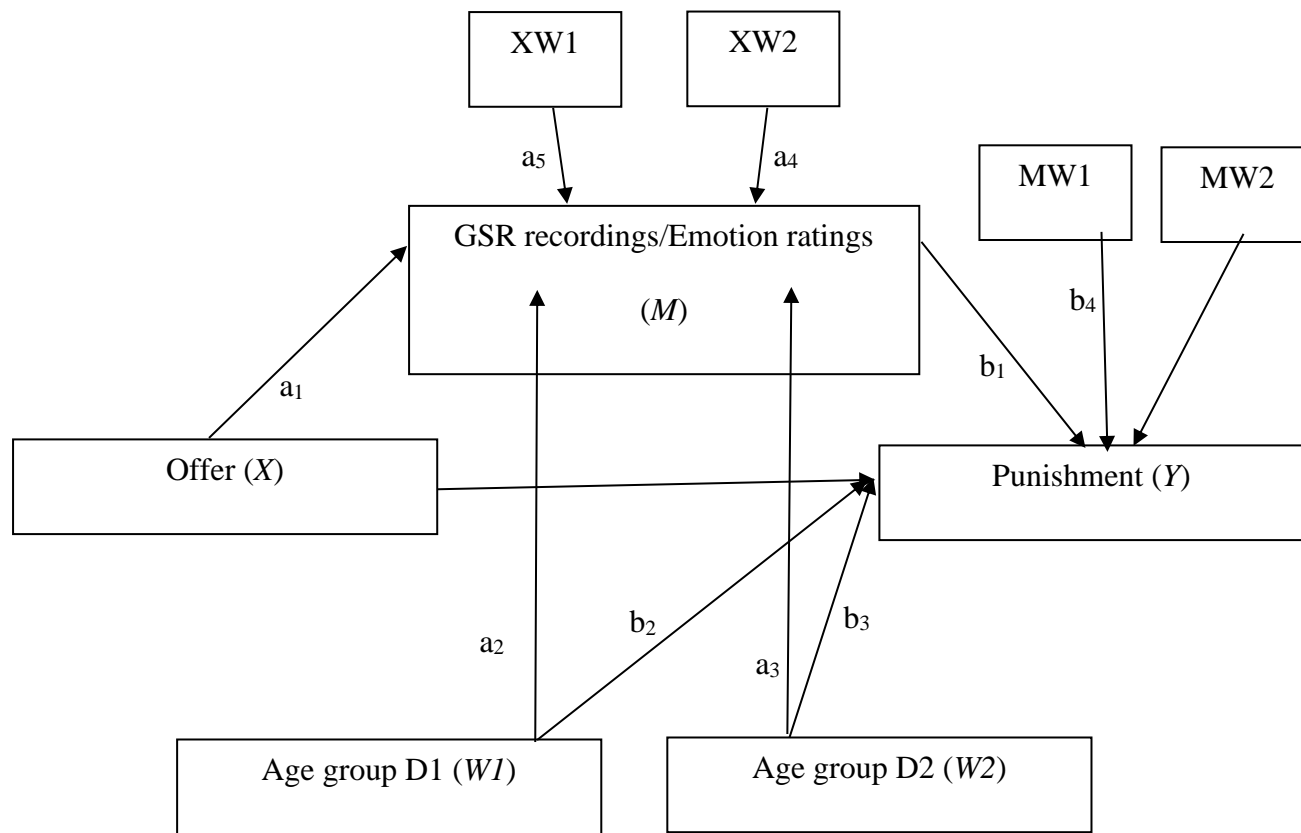
Study 2: Regression Coefficients (Standard Errors) with Confidence Intervals Estimating Galvanic Skin Responses (GSR) and Punishment in Third-Party Punishment (TPP) Game.

	Emotion ratings (<i>M</i>)			Punishment in TPP Game (<i>Y</i>)		
		Coefficient	95% CI		Coefficient	95% CI
Offer (<i>X</i>)	<i>a</i> ₁	-.05 (.02)*	-.09, -.01	<i>c</i> '	-.43 (.03)**	-.48, -.38
GSR (<i>M</i>)				<i>b</i> ₁	.11 (.09)	-.07, .30
Age group D1 (<i>W</i> ₁)	<i>a</i> ₂	-.23 (.12)	-.47, .01	<i>b</i> ₂	-.24 (.12)	-.48, .001
Age group D2 (<i>W</i> ₂)	<i>a</i> ₃	.23 (.12)	-.01, .47	<i>b</i> ₃	-.14 (.12)	-.38, .11
XW1	<i>a</i> ₄	.03 (.03)	-.03, .10			
XW2	<i>a</i> ₅	-.01 (.03)	-.08, .05			
MW1				<i>b</i> ₄	-.02 (.15)	-.31, .27
MW2				<i>b</i> ₅	.08 (.18)	-.27, .44
Constant		.27 (.07)**	.12, .41		3.38 (.11)**	3.16, 3.60
			$R^2 = .02, F(5, 800) = 3.03, p = .01$			
				$R^2 = .29, F(6, 799) = 53.37, p < .01$		

Table S8

Study 2: Regression Coefficients (Standard Errors) with Confidence Intervals Estimating Emotion Ratings and Punishment in Third-Party Punishment (TPP) Game.

	Emotion ratings (<i>M</i>)			Punishment in TPP Game (<i>Y</i>)			
		Coefficient	95% CI		Coefficient	95% CI	
Offer (<i>X</i>)	a ₁	.38 (.05)**	.28, .48	c'	-.40 (.03)**	-.45, -.34	
Emotion ratings (<i>M</i>)				b ₁	.01 (.04)	-.07, .09	
Age group D1 (<i>W</i> 1)	a ₂	-.45 (.25)	-.94, .05	b ₂	-.32 (.27)	-.86, .22	
Age group D2 (<i>W</i> 2)	a ₃	-.50 (.26)	-1.01, .003	b ₃	.90 (.29)**	.33, 1.47	
XW1	a ₄	-.05 (.07)	-.19, .08				
XW2	a ₅	.20**	.05, .34				
MW1				b ₄	.02 (.07)	-.11, .15	
MW2				b ₅	-.27 (.07)**	-.42, .13	
Constant		3.05 (.18)**	2.70, 3.40		3.38 (.11)**	3.16, 3.60	
			$R^2 = .22, F(5, 806) = 45.43, p < .01$				$R^2 = .30, F(6, 805) = 57.78, p < .01$



b₅

Figure S1. Statistical diagram of moderated mediation

