

Supplemental Materials for  
**Potential Causal Influence of Neighborhood Disadvantage on Disordered Gambling:  
Evidence from a Multi-level Discordant Twin Design**

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**Contents:**

- 1) Supplemental Table 1.  
Correlations of facets of MPQ Negative Emotionality and Constraint with disordered gambling symptom counts and neighborhood disadvantage
- 2) Supplemental Table 2.  
Results from multilevel models predicting DSM 5 disordered gambling symptom counts in MZ and DZ twins
- 3) Supplemental Table 3.  
Results from multilevel models predicting SOGS symptom counts in MZ and DZ twins
- 4) Supplemental Table 4.  
Results from multilevel models predicting DSM-IV alcohol use disorder symptom counts in MZ and DZ twins

*Supplemental Table 1. Correlations of facets of MPQ Negative Emotionality and Constraint with disordered gambling symptom counts and neighborhood disadvantage*

MPQ Superfactor or facet	Disordered gambling	Neighborhood disadvantage
Negative Emotionality	<b>0.21</b>	<b>0.12</b>
Stress Reaction	<b>0.14</b>	<b>0.06</b>
Alienation	<b>0.18</b>	<b>0.14</b>
Aggression	<b>0.16</b>	<b>0.05</b>
Constraint	<b>-0.08</b>	0.03
Control	<b>-0.13</b>	-0.03
Harm Avoidance	<b>-0.06</b>	0.01
Traditionalism	0.03	<b>0.09</b>

*Note:* MPQ = Multidimensional Personality Questionnaire; significant correlations ( $p < .05$ ) are in bold font.

*Supplemental Table 2. Results from multilevel models predicting DSM-5 disordered gambling symptom counts in MZ and DZ twins*

Predictor	Base Model		Personality		Education		Income		Fully Adjusted	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Sex	1.80**	(1.20, 2.70)	1.76*	(1.07, 2.88)	1.78**	(1.20, 2.63)	1.98**	(1.31, 2.97)	1.65	(0.99, 2.73)
Age	1.06	(0.97, 1.16)	1.03	(0.93, 1.15)	1.07	(0.98, 1.17)	1.08	(0.98, 1.18)	1.04	(0.94, 1.16)
WP Disadvantage	1.18*	(1.04, 1.35)	1.14	(0.97, 1.34)	1.19**	(1.05, 1.36)	1.20**	(1.05, 1.37)	1.14	(0.96, 1.34)
BP Disadvantage	1.18***	(1.08, 1.28)	1.07	(0.97, 1.19)	1.11*	(1.02, 1.22)	1.13*	(1.02, 1.24)	1.07	(0.96, 1.19)
WP Positive Emotionality			1.00	(0.96, 1.04)					1.00	(0.96, 1.04)
BP Positive Emotionality			0.99	(0.96, 1.02)					0.99	(0.96, 1.02)
WP Negative Emotionality			1.05*	(1.00, 1.09)					1.05*	(1.01, 1.09)
BP Negative Emotionality			1.12***	(1.08, 1.15)					1.11***	(1.08, 1.15)
WP Constraint			0.97	(0.92, 1.01)					0.97	(0.92, 1.01)
BP Constraint			0.99	(0.96, 1.02)					0.99	(0.96, 1.02)
WP Educational Attainment					0.83	(0.61, 1.12)			0.75	(0.51, 1.11)
BP Educational Attainment					0.74***	(0.62, .88)			0.84	(0.67, 1.05)
WP Household Income							0.91	(0.78, 1.06)	0.97	(0.80, 1.16)
BP Household Income							0.93	(0.82, 1.06)	1.10	(0.94, 1.29)

*Note:* Because neither the main effect for zygosity (IRR = 1.08, 95% CI = 0.71 to 1.63,  $p = .715$ ) nor the zygosity x within-pair disadvantage effect (IRR = 1.17, 95% CI = 1.00 to 1.30,  $p = .990$ ) was significant, these predictors were not included in the models.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . DSM 5 = Diagnostic and Statistical Manual of Mental Disorders, Version 5; WP = Within-pair; BP = Between-pair

**Supplemental Table 3.** Results from multilevel models predicting SOGS symptom counts in MZ and DZ twins

Predictor	Base Model		Personality		Education		Income		Fully Adjusted	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Sex	1.75***	(1.42, 2.15)	1.46**	(1.16, 1.85)	1.72***	(1.40, 2.12)	1.79***	(1.45, 2.23)	1.46**	(1.14, 1.86)
Age	1.02	(0.97, 1.07)	1.01	(0.96, 1.07)	1.02	(0.97, 1.07)	1.03	(0.98, 1.08)	1.02	(0.97, 1.08)
WP Disadvantage	1.09***	(1.04, 1.15)	1.08**	1.02, 1.14)	1.09**	(1.03, 1.15)	1.09**	(1.03, 1.15)	1.07*	(1.01, 1.14)
BP Disadvantage	1.13***	(1.07, 1.19)	1.07*	(1.01, 1.14)	1.08**	(1.03, 1.14)	1.10**	(1.04, 1.16)	1.04	(0.98, 1.11)
WP Positive Emotionality			1.00	(0.98, 1.01)					1.00	(0.99, 1.02)
BP Positive Emotionality			1.00	(0.98, 1.01)					1.00	(0.98, 1.02)
WP Negative Emotionality			1.04***	(1.02, 1.05)					1.04***	(1.02, 1.05)
BP Negative Emotionality			1.06***	(1.05, 1.08)					1.06***	(1.04, 1.08)
WP Constraint			0.97***	(0.95, 0.99)					0.97***	(0.95, 0.99)
BP Constraint			0.99	(0.97, 1.00)					0.99	(0.97, 1.00)
WP Educational Attainment					0.87*	(0.78, 0.99)			0.92	(0.80, 1.06)
BP Educational Attainment					0.78***	(0.70, 0.86)			0.85**	(0.75, .96)
WP Household Income							0.95	(0.90, 1.01)	0.99	(0.93, 1.05)
BP Household Income							0.91*	(0.85, 0.98)	0.97	(0.90, 1.05)

Note: Because neither the main effect for zygosity (IRR = 1.00, 95% CI = 0.79 to 1.26,  $p = .998$ ) nor the zygosity x within-pair disadvantage effect (IRR = 0.94, 95% CI = 0.85 to 1.04,  $p = .248$ ) was significant, these predictors were not included in the models.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . SOGS = South Oaks Gambling Screen; WP = Within-pair; BP = Between-pair

**Supplemental Table 4.** Results from multilevel models predicting alcohol use disorder symptom counts in MZ and DZ twins

Predictor	Base Model		Personality		Education		Income		Fully Adjusted	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Sex	1.85***	(1.52, 2.25)	1.52***	(1.21, 1.89)	1.86***	(1.53, 2.27)	1.90***	(1.55, 2.32)	1.50***	(1.19, 1.89)
Age	0.96	(0.92, 1.01)	0.97	(0.93, 1.02)	0.96*	(0.92, 1.00)	0.96	(0.92, 1.01)	0.97	(0.93, 1.02)
WP Disadvantage	1.00	(0.94, 1.07)	0.97	(0.90, 1.04)	1.01	(0.94, 1.07)	0.99	(0.92, 1.06)	0.96	(0.89, 1.03)
BP Disadvantage	0.99	(0.95, 1.04)	0.95*	(0.90, 0.99)	0.97	(0.93, 1.02)	0.98	(0.93, 1.02)	0.92**	(0.87, 0.97)
WP Positive Emotionality			0.99	(0.97, 1.01)					0.99	(0.97, 1.01)
BP Positive Emotionality			0.99	(0.98, 1.01)					0.99	(0.98, 1.01)
WP Negative Emotionality			1.04***	(1.02, 1.06)					1.04***	(1.02, 1.06)
BP Negative Emotionality			1.04***	(1.03, 1.05)					1.04***	(1.02, 1.05)
WP Constraint			0.98*	(0.96, 1.00)					0.98*	(0.96, 1.00)
BP Constraint			0.96***	(0.95, 0.97)					0.96***	(0.94, .97)
WP Educational Attainment					0.98	(0.85, 1.13)			1.03	(0.87, 1.20)
BP Educational Attainment					0.88**	(0.81, 0.97)			0.88*	(0.79, .98)
WP Household Income							0.91**	(0.85, 0.98)	0.96	(0.89, 1.03)
BP Household Income							0.96	(0.91, 1.02)	1.00	(0.93, 1.07)

Note: Because neither the main effect for zygosity (IRR = 1.00, 95% CI = 0.79 to 1.26,  $p = .194$ ) nor the zygosity x within-pair disadvantage effect (IRR = 0.94, 95% CI = 0.85 to 1.04,  $p = .594$ ) was significant, these predictors were not included in the models.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . WP = Within-pair; BP = Between-pair