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Title: Me, My Friends, and I: a neuro-ecological perspective on adolescent prosocial development
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SUPPLEMENTARY MATERIAL TO CHAPTER 2

Supplementary Table 1 shows a detailed overview of the frequency of choices per game. Supplementary Table 2 shows a detailed overview of the frequency of decision-making profiles. Supplementary Table 3 shows correlations of the individual games and the decision-making profiles with several psychosocial measures, to support the validity of the games and the profiles.

In order to be able to replicate previous findings, we analyzed our data based on the three games (Non-costly efficient equity game: 1-1 vs. 1-0; Self-costly equity game: 1-1 vs. 2-0; Other-costly inefficient equity game: 1-1 vs. 1-2) employed in the previous studies by Fehr, Bernhard, and Rockenbach (2008) Fehr, Glätzle-Rützler, and Sutter (2013) and Steinbeis and Singer (2013). We conducted the analyses for these profiles in the same manner as described in our manuscript. Supplementary Table 4 shows the composition of the five decision-making profiles, Equity-strong, Equity-weak, Generosity-strong, Generosity-weak, and Spitefulness, based on these three games. The results for model selection with the three games are shown in Supplementary Table 5 and the regression coefficients for the model with the best fit are shown in Supplementary Table 6. Figure 1 shows the distribution of decision-making profiles over age groups based on three games (excluding the Self-costly inefficient equity game) for boys (Figure 1A) and girls (Figure 1B), separately.
### Table 1
Descriptives for choices in the allocation games

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>M(_{age}) (SD)</td>
</tr>
<tr>
<td><strong>Non-costly efficient equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-0</td>
<td>622</td>
<td>591</td>
<td>14.3 (1.95)</td>
</tr>
<tr>
<td>1-1</td>
<td></td>
<td></td>
<td>85.7 (2.16)</td>
</tr>
<tr>
<td><strong>Self-costly equity</strong></td>
<td>624</td>
<td>592</td>
<td></td>
</tr>
<tr>
<td>2-0</td>
<td></td>
<td></td>
<td>28.5 (2.20)</td>
</tr>
<tr>
<td>1-1</td>
<td></td>
<td></td>
<td>71.5 (2.10)</td>
</tr>
<tr>
<td><strong>Other-costly inefficient equity</strong></td>
<td>622</td>
<td>591</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td></td>
<td></td>
<td>26.8 (1.96)</td>
</tr>
<tr>
<td>1-1</td>
<td></td>
<td></td>
<td>73.2 (2.17)</td>
</tr>
<tr>
<td><strong>Self-costly inefficient equity</strong></td>
<td>622</td>
<td>591</td>
<td></td>
</tr>
<tr>
<td>2-1</td>
<td></td>
<td></td>
<td>55.5 (2.09)</td>
</tr>
<tr>
<td>1-1</td>
<td></td>
<td></td>
<td>44.5 (2.08)</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>M_{age} (SD)</td>
</tr>
<tr>
<td>Equity-strong</td>
<td>189</td>
<td>44.2</td>
<td>13.53 (2.02)</td>
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<tr>
<td>Equity-weak</td>
<td>61</td>
<td>53.0</td>
<td>14.27 (2.40)</td>
</tr>
<tr>
<td>Efficiency-other</td>
<td>61</td>
<td>61.0</td>
<td>15.13 (1.53)</td>
</tr>
<tr>
<td>Efficiency-self</td>
<td>39</td>
<td>70.9</td>
<td>14.99 (1.78)</td>
</tr>
<tr>
<td>Humility</td>
<td>44</td>
<td>60.3</td>
<td>13.42 (2.29)</td>
</tr>
<tr>
<td>Spite</td>
<td>44</td>
<td>61.1</td>
<td>14.88 (2.06)</td>
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<tr>
<td>Unclassified</td>
<td>184</td>
<td>49.7</td>
<td>14.02 (2.15)</td>
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<tr>
<td>Total</td>
<td>622</td>
<td>51.3</td>
<td>14.08 (2.14)</td>
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Table 3
Partial point-biserial correlations between equity decisions and psychosocial measures

<table>
<thead>
<tr>
<th></th>
<th>Empathy</th>
<th>Perspective-taking</th>
<th>Machiavellianism</th>
<th>Impulsivity</th>
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<tr>
<td>Non-costly efficient equity</td>
<td>.12***</td>
<td>.09**</td>
<td>-.11***</td>
<td>-.03</td>
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<tr>
<td>Self-costly equity</td>
<td>.18***</td>
<td>.10**</td>
<td>-.18***</td>
<td>-.05</td>
</tr>
<tr>
<td>Other-costly inefficient equity</td>
<td>-.04</td>
<td>.00</td>
<td>-.04</td>
<td>-.04</td>
</tr>
<tr>
<td>Self-costly inefficient equity</td>
<td>.07*</td>
<td>.05</td>
<td>-.13***</td>
<td>-.03</td>
</tr>
<tr>
<td>Equity-strong</td>
<td>.08**</td>
<td>.05</td>
<td>-.14***</td>
<td>-.06*</td>
</tr>
<tr>
<td>Equity-weak</td>
<td>-.04</td>
<td>.01</td>
<td>.05</td>
<td>-.02</td>
</tr>
<tr>
<td>Efficiency-other</td>
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<td>.06</td>
<td>-.03</td>
<td>-.01</td>
</tr>
<tr>
<td>Efficiency-self</td>
<td>-.04</td>
<td>-.05</td>
<td>.11***</td>
<td>.03</td>
</tr>
<tr>
<td>Humility</td>
<td>.08**</td>
<td>.01</td>
<td>-.01</td>
<td>.02</td>
</tr>
<tr>
<td>Spite</td>
<td>-.15***</td>
<td>-.11***</td>
<td>.12***</td>
<td>.02</td>
</tr>
<tr>
<td>Unclassified</td>
<td>-.04</td>
<td>-.02</td>
<td>.03</td>
<td>.04</td>
</tr>
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</table>

Note. *p < .05, **p < .01, ***p < .001. Controlled for age and gender. Empathy was measured with the Empathy Questionnaire (EmQue; Overgaauw, Rieffe, Crone, & Güroğlu, 2017), with higher scores associated with more empathy; perspective-taking was measured with the Perspective-taking subscale of the Interpersonal Reactivity Index (IRI; Davis, 1980), with higher scores associated with higher levels of perspective-taking; Machiavellianism was measured with the MACH-IV scale (Christie & Geis, 1970) with higher scores associated with more Machiavellianism; Impulsivity was measured with the Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995), with higher scores associated with more impulsivity.
Table 4
Choices in each game determining the construction of decision-making profiles based on three games (excluding the Self-costly inefficient equity game)

<table>
<thead>
<tr>
<th></th>
<th>Non-costly efficient equity game</th>
<th>Self-costly equity game</th>
<th>Other-costly inefficient equity game</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity-strong</td>
<td>1-1</td>
<td>1-1</td>
<td>1-1</td>
</tr>
<tr>
<td>Equity-weak</td>
<td>1-1</td>
<td>2-0</td>
<td>1-1</td>
</tr>
<tr>
<td>Generosity-strong</td>
<td>1-1</td>
<td>1-1</td>
<td>1-2</td>
</tr>
<tr>
<td>Generosity-weak</td>
<td>1-1</td>
<td>2-0</td>
<td>1-2</td>
</tr>
<tr>
<td>Spite</td>
<td>1-0</td>
<td>2-0</td>
<td>1-1</td>
</tr>
</tbody>
</table>
### Table 5
Model selection based on Step Chi-square and Akaike’s Information Criterion for decision-making profiles based on three games (excluding the Self-costly inefficient equity game)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model ID</th>
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<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>$\chi^2$ (df = 5)</td>
<td>$\chi^2$ (df = 6)</td>
<td>$\chi^2$ (df = 7)</td>
<td>$\chi^2$ (df = 8)</td>
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<tr>
<td>Equity-strong</td>
<td>1213</td>
<td>7.27</td>
<td>1678.89</td>
<td>10.76**</td>
<td>1670.13</td>
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<tr>
<td>Equity-weak</td>
<td>1213</td>
<td>2.78</td>
<td>918.83</td>
<td>.398</td>
<td>920.43</td>
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<tr>
<td>Generosity-strong</td>
<td>1213</td>
<td>8.70*</td>
<td>995.22</td>
<td><strong>6.96</strong></td>
<td><strong>990.25</strong></td>
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<td>Generosity-weak</td>
<td>1213</td>
<td>4.53</td>
<td>546.26</td>
<td>12.88***</td>
<td>535.37</td>
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<td>Spite</td>
<td>1213</td>
<td>5.54</td>
<td>594.08</td>
<td>1.42</td>
<td>594.65</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01, ***p < .001. Best model in bold font.
**Table 6**  
Regression coefficients and standard errors for the best fitting model for decision-making profiles based on three games (excluding the Self-costly inefficient equity game)

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Coefficient</th>
<th>Intercept (SE)</th>
<th>Gender (SE)</th>
<th>Age (SE)</th>
<th>Gender*Age (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity-strong</td>
<td></td>
<td>0.46*** (0.11)</td>
<td>-0.40** (0.12)</td>
<td>-0.04 (0.05)</td>
<td>-0.14* (0.06)</td>
</tr>
<tr>
<td>Equity-weak</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Generosity-strong</td>
<td></td>
<td>-2.22*** (0.16)</td>
<td>0.44** (0.17)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Generosity-weak</td>
<td></td>
<td>-3.72*** (0.29)</td>
<td>0.91** (0.27)</td>
<td>0.26** (0.09)</td>
<td>-</td>
</tr>
<tr>
<td>Spite</td>
<td></td>
<td>-2.70*** (0.22)</td>
<td>0.29 (0.25)</td>
<td>-0.30* (0.13)</td>
<td>0.43** (0.14)</td>
</tr>
</tbody>
</table>

*Note.* *p < .05, **p < .01, ***p < .001. Best model in bold font.
Figure 1. Proportion in decision-making profile over age groups based on three games (excluding the Self-costly inefficient equity game) for boys (A) and girls (B).
References


References


References


References


References


Smith, C. E., Blake, P. R., & Harris, P. L. (2013). I should but I won't: why young children endorse norms of fair sharing but do not follow them. *Proc one*, 8(3), e59510.


References


Vanhalst, J., Luycx, K., & Goossens, I. (2013). Experiencing loneliness in adolescence: A matter of individual characteristics, negative peer experiences, or both? Social Development, 23, 100–118.


LIST OF PUBLICATIONS


van den Bos, W., Crone, E. A., Meuwese, R., & Güroğlu, B. Social network position and cohesion predict social behavior in adolescence. Submitted for publication.


CURRICULUM VITAE

Rosa Meuwese was born on the 3rd of February 1983 in Weesp, The Netherlands. She graduated from Laar & Berg (secondary school) in Laren (NH) in 2002. In 2007 and 2009 Rosa completed Bachelor’s degrees at the Vrije Universiteit in Amsterdam in both Criminology and Education and Child studies. Afterwards, she continued in the field of Child studies and obtained her Master’s degree in Special Education (Orthopedagogie) in 2010, with a specialization in quantitative research methods. After graduation, she worked as a research assistant in Prof. dr. Eveline Crone’s Brain and Development Lab (Leiden University). In 2012, Rosa started doing PhD-research in the Brain and Development Lab, under supervision of Dr. Berna Güroğlu. She focused her research on associations between peer relationships, prosocial development and brain development in adolescence. Rosa is currently working as a lecturer and tutor at University College Amsterdam and Vrije Universiteit Amsterdam.