Pre-Registration Document

Project working title: Political gaming: using economic games to study the foundations of political ideology

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A. Hypotheses

Hypothesis 1:   Behaviour across eight economic games will load onto two latent variables: (1) willingness to pay a cost to benefit others, and (2) willingness to pay a cost to punish norm-violations. This will replicate previous findings (Peysakhovich, Nowak, & Rand, 2014).

Hypothesis 2:   Social Dominance Orientation will negatively predict variation on the first latent variable (cooperation)

Hypothesis 3:   Right-Wing Authoritarianism will positively predict variation on the second latent variable (punishment)

B. Methods

Variables measured

The following table lists the variables from the New Zealand Attitudes and Values Study (NZAVS). A full data dictionary can be found here: https://www.psych.auckland.ac.nz/en/about/our-research/research-groups/new-zealand-attitudes-and-values-study/nzavs-tech-docs.html.

Variable	Variable name	Item text	Range
SDO1	Social Dominance Orientation	It is OK if some groups have more of a chance in life than others.	1-7
SDO2		Inferior groups should stay in their place.	1-7
SDO3		To get ahead in life, it is sometimes okay to step on other groups.	1-7
SDO4		We should have increased social equality.	1-7
SDO5		It would be good if groups could be equal.	1-7
SDO6		We should do what we can to equalise conditions for different groups.	1-7
RWA1	Right-Wing Authoritarianism	It is always better to trust the judgment of the proper authorities in government and religion than to listen to the noisy rabble-rousers in our society who are trying to create doubt in people's minds.	1-7
RWA2		It would be best for everyone if the proper authorities censored magazines so that people could not get their hands on trashy and disgusting material.	1-7
RWA3		Our country will be destroyed some day if we do not smash the perversions eating away at our moral fibre and traditional beliefs.	1-7

RWA4		People should pay less attention to The Bible and other old traditional forms of religious guidance, and instead develop their own personal standards of what is moral and immoral.	1-7
RWA5		Atheists and others who have rebelled against established religions are no doubt every bit as good and virtuous as those who attend church regularly.	1-7
RWA6		Some of the best people in our country are those who are challenging our government, criticizing religion, and ignoring the "normal way" things are supposed to be done.	1-7
AGE	Age	What is your date of birth?	NA
GEN	Gender	What is your gender?	NA
ETHCAT	Ethnicity	Which ethnic group do you belong to? (NZ census question)	NA
NZREG	Education	*Ordinal-rank measure of level of attainment*	0-10
NZSEI	Socio-economic status	*Ordinal-rank measure of socio-economic status based on occupational categories*	10-90
NZDEP	Local deprivation	*Ordinal-rank deprivation score for each meshblock in New Zealand*	1-10
RELIG	Religiosity	Do you identify with a religion and/or spiritual group?	Yes/No

We will also measure the following behavioural variables from eight one-shot economic games. Possible ranges are given, but these will all be standardised (0-1) across games before analysis.

Variable	Variable name	Operationalised	Range
DG	Dictator Game	Number of points given to Player B	0 – 100 points
TG1	Trust Game (Give)	Decision to give to Player B	Yes / No
TG2	Trust Game (Return)	Number of points returned to Player A	0 – 150 points
PGG	Public Goods Game	Number of points contributed	0 – 100 points
UG1	Ultimatum Game (Offer)	Number of points offered to Player B	0 – 100 points
UG2	Ultimatum Game (MAO)	Minimum acceptable offer from Player A	0 – 100 points
ThirdPP1	Third-Party Punishment Game (Steal)	Decision to steal from Player B	Yes / No
ThirdPP2	Third-Party Punishment Game (Punish)	Number of points removed from Player A for stealing	0 – 100 points
SecondPP1	Second-Party Punishment Game (PD)	Decision to transfer in Prisoner's Dilemma	Yes / No
SecondPP2	Second-Party Punishment Game (Punish Cooperator)	Number of points removed from a cooperator	0 – 50 points

SecondPP3	Second-Party Punishment Game (Punish Defector)	Number of points removed from a defector	0 – 50 points
SH	Stag-Hunt Game	Decision to contribute	Yes / No
SHP1	Stag-Hunt Game with Punishment (SH)	Decision to transfer in Stag Hunt coordination	Yes / No
SHP2	Stag-Hunt Game with Punishment (Punish Cooperator)	Number of points removed from a cooperator	0 – 50 points
SHP3	Stag-Hunt Game with Punishment (Punish Defector)	Number of points removed from a defector	0 – 50 points

Planned sample

Participants will be sampled from those currently participating in the longitudinal NZAVS study, who agreed to take part in an additional study about 'economic decisions in groups'. Participants will be deemed ineligible for the study if they (1) do not have adequate access to the Internet, (2) do not have a quiet place to participate in the study, and (3) do not have a New Zealand bank account (for payment purposes). Participants also must be living in New Zealand to participate. We will terminate data collection once 1000 participants have completed our economic games.

Exclusion criteria

After the games, a participant's data will be excluded if the participant takes less than 5 minutes or more than 50 minutes to complete all eight games. Because of these exclusion criteria, our final retained sample size may be below 1000.

Procedure

In an attempt to replicate previous work, six economic games are largely identical to those in Peysakhovich, Nowak, and Rand (2014), and a further two are additional coordination games. All games involve one-shot decisions between multiple players. The strategy method is used to elicit responses in all possible roles.

Firstly, we include three cooperation games, in which individuals decide whether to pay a personal cost to benefit another player: *Dictator Game*, *Trust Game*, and *Public Goods Game*. Secondly, we include three punishment games, in which individuals decide whether to pay a personal cost to punish another player for their decisions: *Ultimatum Game*, *Third-Party Punishment Game*, and *Second-Party Punishment Game*. Finally, we replace the destructive All-Pay Auction Game used in Peysakhovich *et al.* (2014) for two coordination games: *Stag-Hunt Game*, and *Stag-Hunt Game with Punishment*. These games are kept as identical to the Public Goods Game and Second-Party Punishment Game (respectively) as possible.

These eight economic games are presented in a random order. Using oTree software (Chen, Schonger, & Wickens, 2016), real-time post-hoc matching occurs in groups of four. Participants have a 50-minute time limit to complete the eight economic games. Any participants who take longer than 50 minutes will be skipped ahead to the waiting lobby.

C. Analysis Plan

Before all analyses, game data will be standardised to vary between 0 and 1, and dummy variables (0 or 1) will be used for all binary choices. Data will be excluded following the exclusion criteria above. For analyses 1-3, we delete individual game data if participants failed the comprehension question for that game; for other analyses, the complete dataset is used.

Analysis 1

Using **pairwise Spearman correlations**, we will correlate the following variables:

1. Dictator Game
2. Trust Game (Give)
3. Trust Game (Return)
4. Public Goods Game
5. Stag-Hunt Game
6. Ultimatum Game (MAO)
7. Third-Party Punishment Game (Punish)
8. Second-Party Punishment Game (Punish Defector)
9. Stag-Hunt Game with Punishment (Punish Defector)

We will use Benjamin-Hochberg corrected *p*-values to control for multiple comparisons, and pairwise deletion will be used to deal with any missing data. We expect that variables 1-5 will significantly positively correlate, and that variables 6-9 will also significantly positively correlate, with non-significant correlations elsewhere. While we expect the new games (5 and 9) to correlate with other games as specified above, we are open to the possibility that they may represent distinct forms of cooperation and punishment (leading to lower correlations).

Analysis 2

Principal components analysis (PCA) will be conducted on the variables 1-4 and 6-8 above, the games used in the original Peysakhovich *et al*. (2014) study. We will first determine whether this dataset is appropriate for PCA using the Kaiser-Meyer-Olkin measure of sampling adequacy (>.65) and Bartlett's test of sphericity (*p* < .05). An initial PCA will then be run, and a mixture of scree plot point-of-inflexion and Kaiser's criterion (eigenvalues greater than 1) will be used to decide how many components to retain in a subsequent PCA. Following Peysakhovich *et al*. (2014), missing data will be dealt with via listwise deletion. Depending on the correlations between components, we will decide whether to apply an orthogonal or oblique rotation to improve interpretability. We expect the PCA to produce the two hypothesised components (cooperation and punishment).

Analysis 3

Principal components analysis (PCA) will be conducted on the extended game dataset (including the two new games; variables 1-9 above) to determine if a two-factor structure arises again from the data. We will use the same techniques as in Analysis 2, and again expect the PCA to produce the two hypothesised components (cooperation and punishment).

Analysis 4

Confirmatory factor analysis (CFA) will be conducted to test whether these data fit the hypothesised two-factor structure of cooperation and punishment (Peysakhovich *et al*., 2014). We will include only variables 1-4 and 6-8 above, as these were the measures in the original study. We test whether

the data support a model which loads variables 1-4 onto the first factor (cooperation) and variables 6-8 onto the second factor (punishment).
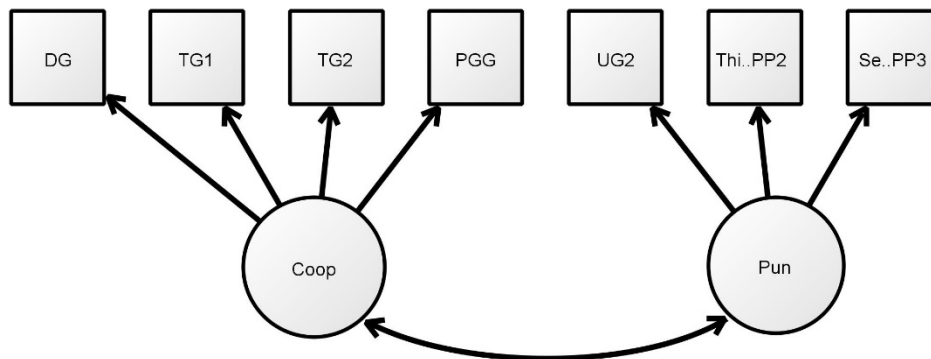

Since this dataset contains a binary variable (TG1) and other non-normal continuous variables, we will use diagonally weighted least squares estimation with robust standard errors (Li, 2016). In Peysakhovich *et al.* (2014), instruction comprehension was controlled by simply removing data for games with incorrect comprehension questions and using listwise deletion for principal components analyses. Instead, for this CFA and subsequent models, we plan to take advantage of the structural equation modelling approach by including a covariate ('proportion of comprehension questions answered correctly') to control for instruction comprehension.

We expect our two-factor model to fit the data well, as measured by following the following criteria:

- *Root Mean Square Error of Approximation.* Excellent fit < .01. Good fit < .05. Mediocre fit < .08 (MacCallum, Browne, & Sugawara, 1996).
- *Standardized Root Mean Square Residual.* Good fit < .08 (Hu & Bentler, 1999).

Analysis 5

Confirmatory factor analysis (CFA) will be conducted on the extended game dataset (including the two new games; variables 1-9 above). We test whether the data support a model which loads variables 1-5 onto the first factor (cooperation) and variables 6-9 onto the second factor (punishment). Again, we analyse the complete dataset and include the comprehension covariate. We hypothesise that this model will also fit the data well, as measured by the same fit criteria.
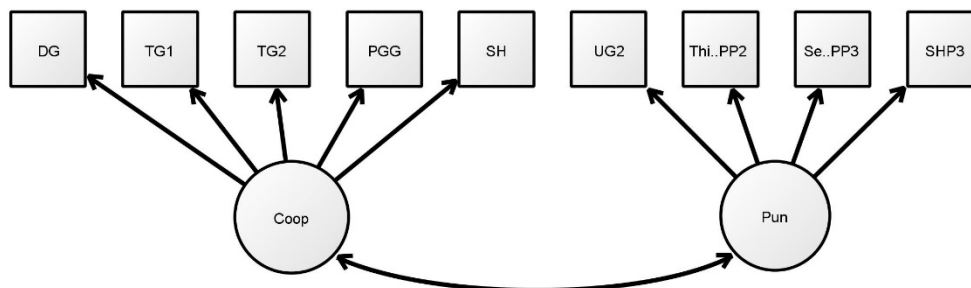
Structural equation modelling (SEM) will be used determine the extent to which the cooperation and punishment factors can be predicted by Right-Wing Authoritarianism (RWA) and Social Dominance Orientation (SDO). We regress our latent variables of cooperation and punishment onto averaged measures (mean of six scale items) of SDO and RWA.

Coop ~ SDO + RWA

Pun ~ SDO + RWA

We will again use diagonally weighted least squares estimation with robust standard errors, analysing the complete game dataset and controlling for comprehension. This model is expected to fit the data well (using the same fit criteria as above). Furthermore, we expect the regression coefficient for SDO -> Cooperation to be significantly negative and the regression coefficient for RWA -> Punishment to be significantly positive ($p < .05$). We do not expect the other regression coefficients (SDO -> Punishment and RWA -> Cooperation) to be significant.

Analysis 7

Further **structural equation models (SEMs)** will repeat the regressions from Analysis 6, controlling for the following additional predictors: age, gender, ethnicity, education, socio-economic status, local deprivation, and religiosity. We will run a variety of models that incrementally add these predictors, again with the latent variables Cooperation and Punishment as dependent variables:

	Model 1	Model 2	Model 3	Model 4	Model 5	Full Model
SDO	■	■	■	■	■	■
RWA	■	■	■	■	■	■
Age	■					■
Gender	■					■
Ethnicity		■				■
Education			■			■
SES				■		■
Deprivation				■		■
Religiosity					■	■

Diagonally weighted least squares estimation with robust standard errors will be used again. The same effects (SDO predicting cooperation, and RWA predicting punishment) are expected to hold even when controlling for these variables. We will explore the effect of these predictors on cooperation and punishment as an additional outcome of this step, but we make no specific predictions for these.

References

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