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Research Article

USING THE PRISONER'S DILEMMA TASK TO EXAMINE THE COOPERATIVE AND SOCIAL EFFECTIVENESS HYPOTHESES OF THE GENERAL FACTOR OF PERSONALITY

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ABSTRACT

The prisoner's dilemma was used to examine the cooperative and social effectiveness hypotheses of the General Factor of Personality (GFP). Consistent with both hypotheses participants who cooperated in the initial round scored higher on the GFP. However, this relationship was attenuated when controlling for life history strategy. Consistent with the social effectiveness hypothesis, a second round of the prisoner's dilemma revealed that participants higher in GFP were more likely to follow a tit-for-tat strategy and this finding remained when controlling for life history strategy. The results show the potential of using games to examine the nature of the GFP and predictions from life history theory. Future research could vary elements of the methods such as playing more iterations of the game and could also utilize different games.

Key words: *General Factor of Personality, Prisoner's Dilemma, Cooperation, Social Effectiveness*

GENERAL FACTOR OF PERSONALITY: COOPERATIVE AND SOCIAL EFFECTIVENESS HYPOTHESES

Research on the General Factor of Personality (GFP) is beginning to shift from the question of whether or not the GFP exists to the question of its nature. While there is a considerable amount of evidence that the GFP is at least in part a function of responding to questionnaire items in a socially desirable manner (e.g., Bäckström, Björklund, & Larsson, 2009) these results are counterweighted by evidence that the GFP is more than just a social-desirability response bias. Associations between the GFP and other variables hold after controlling for such a bias (e.g., Rushton & Erdle, 2010), and in some cases these associations have even been found to be strengthened when response bias is controlled (e.g., Dunkel, Kim, & Papini, 2012).

If the GFP is more than systematic response bias, what then is it? One possibility is that the GFP is a component of life history (LH) strategy and reflects an evolved tendency toward greater cooperation. For example, Rushton, Bons, and Hur (2008) assert the following concerning the nature of the GFP: "The GFP, with a well-defined positive and negative pole (the positive pole being more cooperative and prosocial; the negative pole more antagonistic and inefficient)… (p. 1181)." Indeed, Sherman, Figueredo and Funder (2013) found that a slow LH strategy is marked by timidity, suggesting that individuals with a slow LH strategy (high GFP) may be less inclined toward confrontation. Thus the cooperation hypothesis leads to the expectation of a positive linear association between the GFP and cooperation. Additionally, controlling for LH strategy should eliminate or at least considerably attenuate the association between the GFP and cooperation.

However, continued and more in-depth examination of the GFP has led to a slightly different view. Loehlin (2012; Loehlin & Martin, 2011) proposed that the GFP reflects "social effectiveness." Social effectiveness is more emotional intelligence (Van der Linden, Tsaousis, & Petrides, 2012) than cooperative tendencies. For example, in a recently published paper Dunkel and Van der Linden (2014) found that individuals high in the GFP reported more comfort and confidence in handling potentially awkward social interactions in which they behaved in an uncooperative manner (e.g., turning down the request of a peer or relationship partner?).

The social effectiveness hypothesis leads to the prediction that cooperation is condition dependent. Individuals with high GFP properly enact cooperative or uncooperative strategies depending upon which strategy will increase the odds of the most favorable outcome. For example, from this view, continued efforts at cooperation in the face of uncooperative partners would be an ineffectual behavioral strategy and thus cooperation under these circumstances would be reflective of low GFP. Additionally, because cooperation is a facet of LH strategy, but because social effectiveness entails a greater willingness to be uncooperative and bold (i.e., not timid) when warranted, the social effectiveness hypothesis posits that the relationship between the GFP and cooperation will remain after controlling for LH strategy.

Prisoner's Dilemma

The prisoner's dilemma is a widely used method for the examination of cooperation in the context of decision-making. Two players are faced with a choice to cooperate with or defect from the other player. There are three possible outcomes in the game. If both players decide to cooperate each player receives the same moderately positive outcome, if one player defects and the other cooperates, the one who defects receives a highly positive outcome and the one who cooperates receives a highly negative outcome, and finally if both players defect they both receive a moderately negative outcome (Rapoport & Chammah, 1965).

Two findings related to the prisoner's dilemma are especially pertinent to the current investigation. While the most successful strategy is always dependent upon the other player, Axelrod (1984) found that a tit-for-tat strategy consistently produced the best results. In the tit-for-tat strategy a player initially cooperates and then simply mimics the other player's response from the previous round (Axelrod, 1984). Second, individual differences have been found to be predictive of the actual strategy taken. For example, Hirsh and Peterson (2009) found that of the Big Five personality traits, only neuroticism was associated with the tendency to cooperate or defect. Seemingly contrary to the thrust of the hypotheses presented here, neuroticism was positively associated with cooperation. However, the GFP was not examined.

Hypotheses

The cooperation and social effectiveness hypotheses both predict that those who initially cooperate will have higher GFP scores. However, the cooperation and social effectiveness hypotheses make different predictions with regard to the role of the GFP in guiding decision making in the prisoner dilemma in the second round. The cooperation hypothesis leads to the prediction that the GFP should be associated with an inclination to cooperate. Alternatively, the social effectiveness hypothesis leads to the prediction that GFP should be associated with the simple, but successful tit-for-tat strategy. Additionally, because the cooperation hypothesis is based on the belief that the GFP represents LH strategy the association between the GFP and cooperation will be attenuated when controlling for LH strategy.

METHOD

Participants

Sixty-two undergraduate students at a Midwestern university took part in the study for research credit. The age range of participants was from 17 to 25 (M = 19.82, SD = 17.60). The sample was made up of 39 females (62.90%) and 23 males (37.10%). Twenty-five (40.30%) of the participants were Black, 25 (40.30%) were White, seven (11.30%) were Hispanic, one was Asian (1.60%), four (6.45%) either marked "other" or did not respond to the question concerning ethnicity.

Measures and Procedure

LH Strategy. LH strategy score was the composite of two LH measures; the Mini-*K* (Figueredo et al., 2006) and the High-*K* Strategy Scale (HKSS; Giosan, 2006). A composite LH strategy score was computed by converting the totals to *z*-scores and summing the two values.

GFP. The GFP was computed using the Big Five Inventory (BFI; John, Naumann, & Soto, 2008). Scores for each of the Big Five personality traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism were computed and were then transformed into *z*-scores and weighted using the weights for computing the GFP from Van der Linden, te Nijenhuis, and Bakker (2010).

Prisoner's Dilemma. The traditional backstory in which a player's jail sentence is contingent upon both of the players' decision to cooperate or defect was presented to participants. Participants were led to believe that there was an actual player in another room, with whom they were paired. Participants submitted their initial decision to a research assistant, at which time the assistant left the room to "collect" the response from the other participant.

In actuality, a quasi-experimental procedure was employed in which the research assistant randomly selected the feedback for the participant (i.e., the other player defected or cooperated). The feedback was then submitted to the participant and a second round of the prisoner's dilemma was played. The participant's second response was then recorded. Three participants failed to submit a second response. After the two rounds of the prisoner's dilemma the participants completed the self-report questionnaires.

RESULTS

Initial Response

Independent samples *t*-tests were run to examine the differences in the GFP and LH strategy for participants that cooperated versus those who defected in the initial Prisoner's dilemma decision. As seen in Table 1, those who cooperated had significantly higher GFP scores. While the same pattern was seen with LH scores, the differences between participants who cooperated versus those who defected did not quite reach significance using a two-tailed test.

Table 1. Means, Standard Deviations, and Independent t-tests for Cooperation or Defection at Time 1

	Cooperate (n =45)	**Defect (n=17)**	**t**	**p**
LH Strategy	.22 (1.59)	-.58 (1.54)	1.79	0.08
GFP	.22 (1.41)	-.59 (1.26)	2.08	0.04

Next, differences between participants who cooperated versus those who defected on the GFP while controlling for LH strategy were examined. Conducting a One-Way Analysis of Covariance, the results showed that the difference between cooperators and defectors was no longer significant when controlling for LH strategy, $F(1, 56) = 1.85$, $p = .18$.

Second Response

Hierarchical linear regression was used to examine the second response to the prisoner's dilemma. In Step 1, the dummy coded initial response (0 = cooperate, 1 = defect) was entered. In Step 2, dummy coded feedback (0 = cooperate, 1 = defect) and the GFP were entered. In Step 3, the interaction term (the product of the feedback and the GFP) was entered. The dependent variable was decision to cooperate (0) or defect (1) at time two. While logistic regression is often thought to be a necessary prescription for a dichotomous dependent variable, Hellevik (2009) has shown that the results vary little between logistic and linear regression (linear regression may actually be preferable) and that the results produced by linear regression are easier to interpret.

The results of the hierarchical regression analysis can be seen in Table 2. The response from Time 1, feedback, and the interaction term of the feedback and the GFP were significant. The analyses were run a second time with LH strategy entered in Step 1. The feedback X GFP interaction remained significant, $\beta = .35$, $p < .01$. Table 3 was constructed to assist in the interpretation of the interaction.

Table 2. Regression Weights and Variance Accounted for in Hierarchical Regression Predicting Cooperation or Defection at Time 2

Variable	β Step 1	βs Step 2	βs Step 3
Time 1 response	.55***	.64***	.62***
Feedback		.39***	.37***
GFP		.18	-.02
Feedback X GFP			.33**
ΔR2	.30***	.19***	.07**

Note. * $p < .05$; ** $p < .01$, *** $p < .001$.

The values in Table 3 appear to indicate that the GFP was predictive of implementation of the tit-for-tat strategy. To test this interpretation GFP scores were collapsed so that there were two groups based on implementation of the tit-for-tat and deviation from the tit-for-tat strategy. The difference between participants who followed the tit-for-tat strategy ($M = .34$, $SD = 1.42$) and those who did not ($M = -.63$, $SD = 1.19$) was significant, $t(54) = 2.60$, $p < .01$.

Table 3. GFP Means and Standard Deviations by Partner Feedback and Time 2 Decision

Decision	Partner Feedback	
	Cooperate	Defect
Cooperate	.14 (1.45)	-.87 (.64)
Defect	-.53 (1.37)	.70 (1.34)

DISCUSSION

The rapidly evolving research on the GFP is beginning to provide information on the nature of the construct. The current investigation is important in that it went beyond correlational methods, using the prisoner's dilemma model with an experimental manipulation to examine the cooperative and social effectiveness hypotheses. The results from the initial prisoner's dilemma decision support the idea that those high in GFP are more cooperative; participants who choose to initially cooperate had higher GFP scores. Supporting the hypothesized placement of the GFP and cooperation under the banner of LH strategy this difference was no longer significant when controlling for LH strategy.

However, participants' second decision following randomly assigned feedback indicated that those high in GFP do not operate using cooperation blindly, they are more likely to respond adeptly to social feedback, illustrating social effectiveness. Following the lead of the feedback those high in GFP cooperated when the other player did and defected in the face of other player's defection. Alternatively, those low in GFP defected in the face of cooperation and cooperated when informed that the other player defected.

Limitations and Future Research

This initial investigation of the GFP using game methods suggests that further exploration using similar methods is warranted. This is especially important given the small sample sizes often employed in such studies (e.g., Shoda & McConnell, 2013; Piazza & Bering, 2008); including the current study. Some support was found for both the cooperation and social effectiveness hypotheses, with greater support being found for the social effectiveness hypothesis, and given that the two hypotheses are not mutually exclusive it may reflect that the underlying nature of the GFP is pro-social effectiveness. Axelrod's (1984) summary of a successful strategy (e.g., tit-for-tat) seems to reflect this: cooperate as long as the other player cooperates, no longer cooperate in the face of defection, promptly resume cooperation (i.e., forgive) if resuming cooperation is an available option, and behave in a clear and consistent manner so that others can adapt to your behavior pattern.

If tests are run to see if the results can be replicated, it would be worthwhile to play multiple iterations of the prisoner's dilemma. That way it can be ascertained whether the tit-for-tat strategy continues for those high in the GFP, or potentially more intriguing, if

individuals high in GFP are capable of utilizing alternative zero determinant strategies to try and best an opponent (Press & Dyson, 2012; Stewart & Plotkin, 2012).

Finally, an anonymous reviewer made two apt suggestions. Research on the GFP could be extended into personality as conceptualized by the Myers Briggs Type Indicator in which case it would appear that a high GFP would correspond with extraversion, intuition, feeling, and judging (McCrae & Costa, 1989). More importantly, the findings that those high in the GFP utilized a tit-for-tat strategy is reminiscent of a retaliator strategy in the Hawk-Dove game which Smith (1982) identifies as a possible successful 'evolutionary stable strategy'. This would imply that the GFP would be the optimal personality configuration with deviations often leading to less successful outcomes. Interestingly, this strain of thought is consistent with findings in the genetics of personality by Verweij and colleagues (2010, 2012) in which a GFP was found to be maintained via mutation-selection balance.

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