

# Relationship Between Reward-Dominant Response Style and Ratings of Boys' Conduct Problems

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Basic personality dimensions thought to underlie common forms of child psychopathology are of interest in cognitive-behaviour therapy if related to reinforcement contingencies used in treatment. Reward dominance, or the tendency to be overly influenced by past experience of reward, is one such response style. To obtain cross-national information on this phenomenon, 136 New Zealand boys (aged 6 and 7) were administered a version of the Miami Door Opening Task and rated for conduct problems by parents and teachers. Half the boys were also given a brief cognitive intervention designed to encourage an adaptive, self-regulatory strategy that could have improved performance. Compared to a neutral intervention, however, this manipulation did not influence performance on the task. The majority of the participants tended towards a reward-dominant response style, demonstrating that inhibiting a previously rewarded behaviour in order to maximise a score is not typical for boys of this age. However, the 10% of boys who met clinical criteria for conduct disorder, but who had not been clinically referred, did all score in the most reward dominant category.

There has been considerable interest in developmental psychopathology over the phenomenon of reward dominance in children and its relationship to conduct disorder and antisocial behaviour. A major impetus for this research has been evidence of continuity between externalising problems in young children and antisocial activities in adolescents (e.g., Fergusson & Horwood, 1996; Loeber, 1990; Patterson, Reid, & Dishion, 1992). This progression indicates that very basic dimensions of personality may be implicated in children who are "early starters" with difficult temperaments, distractibility, and

oppositional characteristics. Moffitt (1993) suggested these difficulties were linked to neurological deficits in verbal regulation of behaviour and in executive functioning.

Lynam (1996) has proposed that children with this combination of conduct and attentional symptoms have a deficit in personal constraint, related to a reward-dominant response style. Broadly speaking, reward dominance refers to the tendency to engage persistently in previously reinforced behaviour, even when it is no longer adaptive to do so (Newman, Patterson, & Kosson, 1987). The term "dominance" implies that the tendency to continue behaviour that is rewarded is greater than the tendency to cease (or inhibit) behaviour that is punished. This is not the same as delay of gratification (Rachlin & Green, 1972), which involves selecting a larger, more distant reinforcement over a smaller but more immediate one.

Eysenck (1964) was the earliest theorist to suggest that delinquent or psychopathic individuals have difficulty inhibiting previously rewarded behaviour. Gray (1982) extended this model, noting that there are two major motivational systems in the brain: the dopaminergic or activating system that processes information about reward, and the serotonergic or inhibiting system that is responsive to novel cues from the environment and stimuli associated with past punishment. It was argued that individuals with a dominant inhibitory system are anxiety prone, and those with a dominant activation system are reward focused. In two British studies, Fonseca and Yule (1995) confirmed that severely conduct disordered and delinquent children were more sensitive to reward than were a normative sample.

A modification of Gray's theory has been articulated by Quay (1988). According to this model, conduct disorder involves a behavioural activation system that dominates the inhibition system, whereas a depressed inhibition system is thought to underlie attention deficits. Shapiro, Quay, Hogan, and Schwartz (1988) tested these assumptions with a card-playing task, involving both reward and punishment. Children diagnosed as conduct disordered played significantly more cards. In a subsequent study, Daugherty and Quay (1991) examined reward dominance in children

diagnosed according to various categories: conduct disorder, attention-deficit/hyperactivity disorder (ADHD), both conduct disorder and ADHD, and anxiety-withdrawal. They devised a computer game in which the probability of opening a winning door decreased with each succeeding set of doors. Participants could exchange points gained in the game for a range of prizes that required higher points for the most desired prizes. Children in both the conduct disorder and the conduct disorder/ADHD groups persevered with the game, even when the probability of winning a satisfactory prize was decreasing.

Many variables influence performance on tasks supposedly reflecting reward dominance. Fonseca and Yule (1995) found that reward dominance declined with age. Berman (1973) proposed that antisocial individuals performed on reward-dominance tasks in a similar fashion to younger children, persevering even when the odds were stacked against them. Anxiety has been found to influence the number of doors opened (O'Brien, Frick, & Lyman, 1994), such that boys with disruptive behaviour disorders showed reward dominance only when anxiety was controlled. O'Brien and Frick (1996) confirmed that children with an anxiety disorder opened significantly fewer doors. Conversely, those children who were most reward dominant were those with psychopathic traits and no anxiety.

An issue that has not yet been addressed in the literature is the possible relationship between characteristics believed to underlie conduct disorder and the clinical interventions commonly used to modify inappropriate behaviour (cf. Dumas, 1989; 1992). In this context, basic personality characteristics have relevance for clinical assessment and treatment design, with teaching children to attend to relevant cues and to inhibit their behaviour representing a major approach to clinical treatment (Kendall & Panichelli-Mindel, 1995). Training in problem-solving skills is an effective method of reducing conduct problems, often involving games, stories, and academic tasks (Kazdin, 1993). However, the focus has been on impulsivity, where the child seems motivated by potential reward rather than attending to the most salient environmental cue. Since a diversity of cognitive skills is typically taught in any treatment program (Curtis, Ronan, Heiblum, Reid, & Harris, 2002, this series), it is not known whether any of them influence characteristics fundamental to conduct disorder, or instead modify the inappropriate behaviours directly. Thus, it is of practical as well as theoretical importance to determine if a reward-dominant style is readily modifiable by a typical cognitive/behavioural intervention.

## Method

### Participants

The participants were 136 boys between the ages of six ( $N = 81$ ) and seven ( $N = 55$ ) years who were enrolled in primary schools. Eight schools agreed to take part, representing a diversity of geographic locations and neighbourhoods of different socioeconomic conditions in the city of Hamilton, New Zealand. The schools distributed information about the study to parents of boys in the desired age range. Parents signed and returned the informed consent letter and

completed a Child Behavior Checklist (CBCL). (The boys were also told later that they could stop the study any time, or decide not to participate at all; neither event occurred for any participant.)

### Materials

**Miami Door Opening Task.** Daugherty and Quay (1991) developed this task, based on a strategy utilised by Newman et al. (1987) to investigate response perseveration in adult psychopaths. Our version of the computer game consisted of a series of 100 door icons that were presented one at a time in a pre-programmed order of winning and losing doors. The child's task was simply to click on the door, at which point it would open to reveal either a happy face (one point gain) or a sad face (one point loss). To prevent the child from simply responding continuously, or impulsively, there was a 3-sec. delay between responding and the presentation of the next door (O'Brien et al., 1994). The game was programmed on an IBM-type laptop computer that automatically recorded the number of doors opened as well as the final number of points scored.

Within the 10 series of 10 presentations, winning and losing doors appeared randomly; however for each set of 10 the probability of winning decreased by 10%. The total points earned were shown continuously at the bottom right-hand corner of the screen, providing the child with a running score of gains and losses, commencing with an initial "gift" of 10 points. Effectively the child could earn until about 35 points were showing on the screen, and then he started to lose more than he had earned, until after 100 doors had been opened the child would have no points. The adaptive behaviour in this game is to "stop while you are ahead." The children had the task explained to them and were then taken through a "trial" where they used the computer controls and were shown the potential prizes to be gained. The four prize boxes were displayed next to the computer, all labelled with the required points that were necessary to take a prize from them.

**Teacher ratings of child's behaviour.** Teachers were asked to provide a global rating of each boy in terms of how well he fitted a description of disruptive behaviour disorder. This description was a composite of the symptoms listed in DSM-IV (American Psychiatric Association, 1994) for conduct disorder and oppositional defiant disorder. The degree to which each boy exhibited the behaviours in the vignette was rated on a 5-point Likert scale from "all the time" to "never."

**Child Behaviour Checklist (CBCL), ages 4-18, parent version** (Achenbach, 1991). The manual provides extensive reliability and validity data for the CBCL, and a large sample, mixed according to socio-economic status and ethnicity, provided US norms for boys aged 6-11 for the social competency and problem scales (Achenbach, 1991); there are, however, no New Zealand norms currently available. A study by Verhulst, Koot, and Van der Ende (1994) investigated the predictive value of the checklist in a sample of 946 children aged 4 to 11, and found that it was a good predictor of later behaviour problems. It was necessary to modify the instrument slightly for the purpose of this study.

We removed all items related to medical conditions, since these were not relevant to this investigation, as well as certain items that are unlikely in a group of non-clinical children of this age (drug and alcohol use, talk of killing self, hearing sounds and voices that aren't there).

**Cognitive intervention and control stories.** Two stories were developed, one as a cognitive intervention ("Fred the Kiwi's Worm Hunting Trip") and one as a control ("Fred the Kiwi Goes Hunting"). Both stories were approximately 700 words long, in language suitable for children of this age. The stories were recorded on audiotape and played to the participants, accompanied by lively coloured illustrations.

The cognitive intervention story was based on standard metacognitive procedures, modelling a verbal strategy for overcoming reward dominance. The story's character, Fred the Kiwi, was shown focused on gaining as many rewards (worms) as possible. Consequently, he failed to notice the sun coming up and was forced to flee home leaving his food reward behind. Fred was then shown learning from this experience and putting the lesson into practice when he went hunting the next night (i.e., "I am not going to make the same mistake again of thinking only of how many worms I can catch. Instead I will stop and think about how I am doing.") Fred would stop every so often and look around, noticing the dawn approaching, and thus had time to take the worms he had captured home to eat. The story reflected an adaptive approach of stopping, thinking, and attending to changes in competing contingencies.

The control story featured the same character, Fred the Kiwi, going worm hunting. It utilized the same illustrations, but there was no cognitive strategy embedded in the text. While the story was interesting, it was a narrative only, containing no messages or morals. Pilot testing of the stories showed that boys of this age could explain the principles of the lesson to be learned from the first story. However in this particular study there was no explicit instruction to link the moral of the story with the subsequent computer game.

### Procedure

A female research assistant collected participants, one at a time, from their classroom, during regular school hours, and ensured that they felt comfortable with the procedure. The participants were tested in a quiet room provided by each school, by one of the authors, with the research assistant present. After the child gave additional verbal consent to proceed, he was randomly assigned to one of the two story conditions. The story was played on audiotape and lasted five minutes. During the story, the child was shown colour pictures to illustrate various scenes.

Immediately after listening to the story, the computer task was introduced. First the boys were shown the four open prize boxes. Printed on the outside of each box was the range of game points required to earn a toy from that box (Box 1, 0-15 points; Box 2, 16-25; Box 3, 26-33; and Box 4, 34-40). The lowest point level box, Box 1, contained only stickers, while Box 4 contained the most attractive prizes, such as model cars and other expensive items that we knew to be highly desirable to boys of this age. This was designed to motivate participants to aim for the top

prizes. Participants were clearly told they could stop at any stage of the game and exchange the points they had obtained for a prize.

After being shown the prizes, participants received standard instructions on how to play the game. They were also given a demonstration of clicking the cursor on the door icons and the consequence of finding a happy or sad face behind these. After telling the researchers when they were ready to stop (or when they had opened 100 doors and the game was over), the boys were allowed to exchange their game points for a prize. They were then taken back to their classroom.

## Results

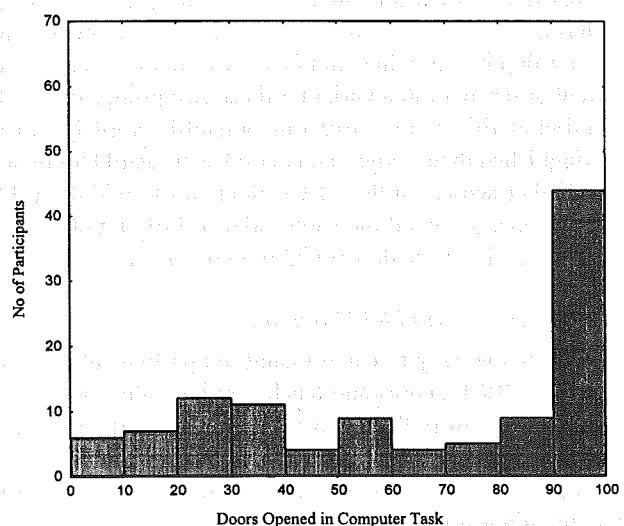
### Behaviour During the Task

Detailed notes on the behaviour of the children were kept by the research assistant. All the boys seemed interested in the game and typically smiled when they scored a point (opened a door to a happy face) and grimaced when they lost a point. Many counted their points out loud until their score was about 20, at which time the number of losing doors increased and the children concentrated more on the computer task. Comments of dismay increased after a number of lost points. Only a few boys overtly verbalized a self-imposed rule, such as "I will stop at 30 points" or "I will stop if I get another losing door," but tended to be successful when they did so. After a string of losing doors, superstitious behaviours were noticed, such as switching hands on the computer mouse, or looking away from the screen. At the end of the game, some participants said that they would play differently next time. Many said they would be willing to play the game again, even though they failed to gain a desirable prize.

### Distribution of Number of Doors Opened

The distribution of scores (not points obtained by each child, but the number of doors opened) is depicted in Figure 1. It

Figure 1. Distribution of numbers of doors opened by all participants on the Miami Door Opening computer task.



will be noted that the modal number of doors opened was between 90 and 100, that is to say, a score supposedly indicating a reward-dominant response style. By responding persistently in this way, the participant lost all points and failed to earn a meaningful prize. However there was a large range of responding, with some participants showing an extremely cautious style, which gained some points but did not permit them to maximize their score. Another group of boys behaved in the most adaptive fashion, continuing until they had earned all the points they could and then quitting while they were ahead (stopping the task as they began to lose systematically). There were no significant differences between the 6-year-olds' performance and that of the 7-year-olds.

#### *Effect of the Story (Experimental Manipulation)*

To see whether the story had any effect on their performance of the computer game, an analysis of variance was conducted with number of doors opened as the dependent variable (see Table 1). To examine the main effect of conduct difficulties, the participants were divided, after the fact, into two groups: Typical and Externalising. The latter category was derived from two criteria: a teacher rating of 3 (occasionally revealing behaviour problems) or greater, and an Externalising score on the CBCL greater than 60 (the bottom of the clinical range). This allowed a 2 (story condition) by 2 (typical or conduct problems) ANOVA to be performed. There were no differences in the two story conditions (means of 68 and 71), however the main effect for conduct was significant, with boys in the Typical group opening an average of 57 doors, and boys in the Externalising group opening 86,  $F(1,102) = 32.9, p < .001$ . There was no significant interaction between story condition and conduct.

#### *Categorising Participants According to Reward Dominance*

A problem with using number of doors opened as the dependent variable for this task is that these scores do not constitute a linear scale. A very low score probably indicates something akin to anxiety (barely persisting with the task and not responding sufficiently to experience much in the way of point loss); 14 boys performed this way. An intermediate score indicates adaptive behaviour, and a high score suggests reward dominance. Using these scoring criteria, 80 boys were classified as Reward Dominant, and 42 as Adaptive. We then conducted *t*-tests to see on which parent or teacher rated variables these two groups differed. Analysed this way, only one variable significantly distinguished them: boys categorised as Reward Dominant had higher scores on the CBCL domain of "withdrawal." High scores on this dimension indicate little involvement in social activities and/or social organizations.

#### *Most Serious Conduct Problems*

An alternative way of categorising the participants was to combine CBCL scores and teacher ratings, thus making it possible to identify those boys who met clinical criteria for conduct disorder. Participants were categorised this way on the basis of both CBCL scores (clinical cut-off,  $T > 70$ ) and the highest level of the teacher ratings. This yielded a

Table 1. Means and Standard Deviations for Number of Doors Opened by Group and Story Condition

Story	Externalising/Typical	N	Doors Opened	SD
Cognitive	Externalising	36	87	23
Cognitive	Typical	27	57	34
Control	Externalising	32	85	24
Control	Typical	35	57	33

total of 13 boys in what might be called a "clinical" subgroup, all of whom revealed a strong reward-dominant style, with 12 of them opening 100 doors (maximum point loss), and one of them opening 66 doors.

#### **Discussion**

In non-clinic referred children, the Miami Door Opening Task yielded great variability, from those boys who stopped the task almost immediately without attempting to maximise their gains, to those who persisted and ended up losing all their previously earned points. A task that produces such wide-ranging individual differences is potentially quite a useful measure, but whether it measures previous learning histories and highly variable decision-making strategies by the children, or whether it measures an enduring and basic trait of "reward dominance," is difficult to know. Further work using tasks of this kind needs to be conducted to better operationalise the construct of reward dominance.

We did show that for these New Zealand boys, performance on the task was not influenced simply by providing a general intervention specifying the value of maximising one's rewards while ahead. The story read to the children seemed to have high interest value for the children and was presented immediately before the task. This procedure represented the sort of cognitive training that might be used clinically in skill-building approaches for this age group: cognitive therapies attempt to teach general internalised rules about taking one's time, looking around, and paying attention to what is being reinforced in a particular situation (Dodge, 1993; Meichenbaum, 1977).

There are various possible reasons why the intervention did not influence the boys' behaviour. One is that the cognitive training simply did not generalise to the computer game, either because the theme was too different and thus not seen as relevant, or because the cognitive message for what Fred the Kiwi should have done is not the same skill as stopping a task when contingencies change. This may be a limitation of cognitive interventions in general. Some boys commented that having experienced the task itself they would do better the next time, and it is likely that direct practice with the task is more influential than very indirect, vicarious instruction whose relevance may not be obvious. It is possible that performance on the Miami Door Opening task is indeed controlled by a response style that serves essentially like a trait-characteristic to influence performance on many tasks involving some combination of loss and gain. The interesting implication of this latter idea is that a self-control strategy emphasising stopping a behaviour, might be less successful than one that encourages the boys not to

think about the reward, such as devaluing or trivialising it (a sour grapes strategy), or imagining gaining some other reward entirely.

Given the variety of sources of individual difference, it is understandable that there would be only a weak relationship between task performance and the degree to which others (teachers and parents) judge the conduct of these children. When the boys were categorised into adaptive versus reward-dominant groups, the reward-dominant responders were rated by their parents as "withdrawn," meaning less involved in social activities, social organizations, and friendships. It is possible that unpopular boys who do not participate in positive social groups, experience the deficit reward environment about which we speculated in the introduction.

On the other hand, classifying children as either Antisocial or Typical, we did find that the boys considered to have externalising conduct problems on two ratings, opened more doors and earned fewer points. It was also possible to look through this large group of school children for those who met *clinical* criteria for conduct disorder. We were able to identify 13 boys with high Externalising scores on the CBCL and the most extreme teacher ratings of problem behaviour. All these boys were high scorers on the task, that is, showing the "reward-dominant style." This finding would seem to replicate previous research demonstrating that clinic-referred children were judged to be reward dominant.

More empirical work will need to be done on this particular task, or others like it, so that the variables influencing performance can be better understood. Anecdotally, those boys who verbalised self-imposed rules, such as "if I lose three more points I will quit," were able to cease responding and maximise their points and thus the value of their reward. Are deficits in such self-regulatory skills part of the characteristics of children thought to be reward dominant? And what about the relative importance of the reward (the points and their related toys) versus the "punishment" or cost of their loss? The boys generally enjoyed the game; like the one-armed bandit of any casino, there is entertainment value in the game itself, regardless of losing the points one had previously earned. In other words, the game taps considerable individual differences in learning histories, self-regulation, and personal values assigned to the tangible gains and losses, and none of these characteristics are easily equatable with reward dominance as understood in the basic biological mechanisms of the reward and punishment systems.

In conclusion, there are some theoretically interesting and plausible links between conduct problems and an emphasis on seeking reward (rather than avoiding punishment). Children who meet clinical criteria for conduct problems of an externalising nature do show a reward-dominant pattern, but so do many other, typical boys. In New Zealand, as in the UK and the USA, the Miami Door Opening Task reveals a widely distributed pattern of behaviour, from a maladaptive tendency to give up early, to perseveration of a previously rewarded behaviour that is no longer functional. Such

variability in behaviour seems worth exploring further, although it is likely that many factors influence children's scores on the task. It cannot yet be confirmed that response style on this task represents a valid and discriminative measure of the latent construct of reward dominance, nor that reward dominance will prove to be an enduring trait derived from individual biological differences.

## References

- Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-18 and 1991 profile*. Burlington, VT: University of Vermont Department of Psychiatry.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Berman, P. W. (1973). Response perseveration and response shift in young children following reward and nonreward. *Child Development*, *44*, 367-371.
- Curtis, N. M., Ronan, K. R., Heiblum, N., Reid, M., & Harris, J. (2002). Antisocial behaviours in New Zealand youth: Prevalence, interventions, and promising new directions. *New Zealand Journal of Psychology* *31*, 53-58.
- Daugherty, T. K., & Quay, H. C. (1991). Response perseveration and delayed responding in childhood behavior disorders. *Journal of Child Psychology and Psychiatry*, *32*, 453-461.
- Dodge, K. A. (1993). Social-cognitive mechanisms in the development of conduct disorder and depression. *Annual Review of Psychology*, *44*, 559-584.
- Dumas, J. E. (1989). Treating antisocial behavior in children: Child and family approaches. *Clinical Psychology Review*, *9*, 197-222.
- Dumas, J. E. (1992). Conduct disorder. In S. M. Turner, K. S. Calhoun, & H. E. Adams (Eds.), *Handbook of clinical behavior therapy* (pp. 285-316). New York: Wiley.
- Eysenck, H. J. (1964). *Crime and punishment*. London: Routledge & Kegan Paul.
- Fergusson, D. M., & Horwood, L. J. (1996). The role of adolescent peer affiliations in the continuity between childhood behavioral adjustment and juvenile offending. *Journal of Abnormal Child Psychology*, *24*, 205-222.
- Fonseca, A. C., & Yule, W. (1995). Personality and antisocial behavior in children and adolescents: An inquiry into Eysenck's and Gray's theories. *Journal of Abnormal Child Psychology*, *23*, 767-781.
- Gray, J. A. (1982). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. New York: Oxford University Press.
- Kazdin, A. E. (1993). Cognitive and behavioral treatments of antisocial behavior in children: Progress and research directions. *Psicologia Conductual*, *1*, 101-130.
- Kendall, P. C., & Panichelli-Mindel, S. M. (1995). Cognitive-behavioral treatments. *Journal of Abnormal Child Psychology*, *23*, 107-124.
- Loeber, R. (1990). Development and risk factors of juvenile antisocial behavior and delinquency. *Clinical Psychology Review*, *10*, 1-41.
- Lynam, D. (1996). Early identification of chronic offenders: Who is the fledgling psychopath? *Psychological Bulletin*, *120*, 209-234.
- Meichenbaum, D. H. (1977). *Cognitive-behavior modification*. New York: Plenum.
- Moffitt, T. E. (1993). Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. *Psychological Review*, *100*, 674-701.
- Newman, J. P., Patterson, C. M., & Kosson, D. S. (1987). Response perseveration in psychopaths. *Journal of Abnormal Psychology*, *96*, 145-148.
- O'Brien, B. S., & Frick, P. J. (1996). Reward dominance: Associations with anxiety, conduct problems, and psychopathology in children. *Journal of Abnormal Child Psychology*, *24*, 223-240.
- O'Brien, B. S., Frick, P. J., & Lyman, R. D. (1994). Reward dominance among children with disruptive behavior disorders. *Journal of*

- Psychopathology and Behavior Assessment*, 16, 131-145.
- Patterson, G. R., Reid, J. B., & Dishion, T. J. (1992). *Antisocial boys: A social interactional approach*. Eugene, OR: Castalia Publishing.
- Quay, H. C. (1988). The behavioral reward and inhibition system in childhood behavior disorders. In I. M. Bloomingdale (Ed.), *Attention deficit disorder* (Vol. 3, pp. 176-186). Oxford: Pergamon.
- Rachlin, H., & Green, L. (1972). Commitment, choice and self-control. *Journal of the Experimental Analysis of Behavior*, 17, 15-22.
- Shapiro, S. K., Quay, H. C., Hogan, A. E., & Schwartz, K. P. (1988). Response perseveration and delayed responding in undersocialized aggressive conduct disorder. *Journal of Abnormal Psychology*, 97, 371-373.
- Verhulst, F. C., Koot, H. M., & Van der Ende, J. (1994). Differential predictive value of parents' and teachers' reports of children's problem behaviors: A longitudinal study. *Journal of Abnormal Child Psychology*, 22, 531-546.

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