

Individual Differences in Delay Discounting

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Background

Delay discounting refers to the decrease in value of a reward the longer it takes to arrive. Choosing between a **smaller sooner** and a **larger later** reward depends on delay discounting.

Delay discounting deficits are evident in addiction and gambling disorders with individuals producing impulsive choice behavior

Delay discounting is a combination of two factors; time taken to receive reward – **reward delay** and size of reward – **reward magnitude**

Deficits in delay discounting can be a result of deficits in timing reward delay or reward magnitude deficits

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Deficits in delay discounting can be a result of deficits in timing reward delay or sensitivity to reward magnitude

SSLL Delay Discounting

Choice between:

Response A –

Short delay Small magnitude

Response B –

Long delay Large magnitude

Between phase manipulations

Reward delay (SS)

SS 1 pellet v LL 2 pellet

2.5s v 30s

5s v 30s

10s v 30s

15s v 30s

30s v 30s

Reward magnitude (LL)

SS 10s v LL 30s

1 pellet v 1 pellet

1 pellet v 2 pellet

1 pellet v 3 pellet

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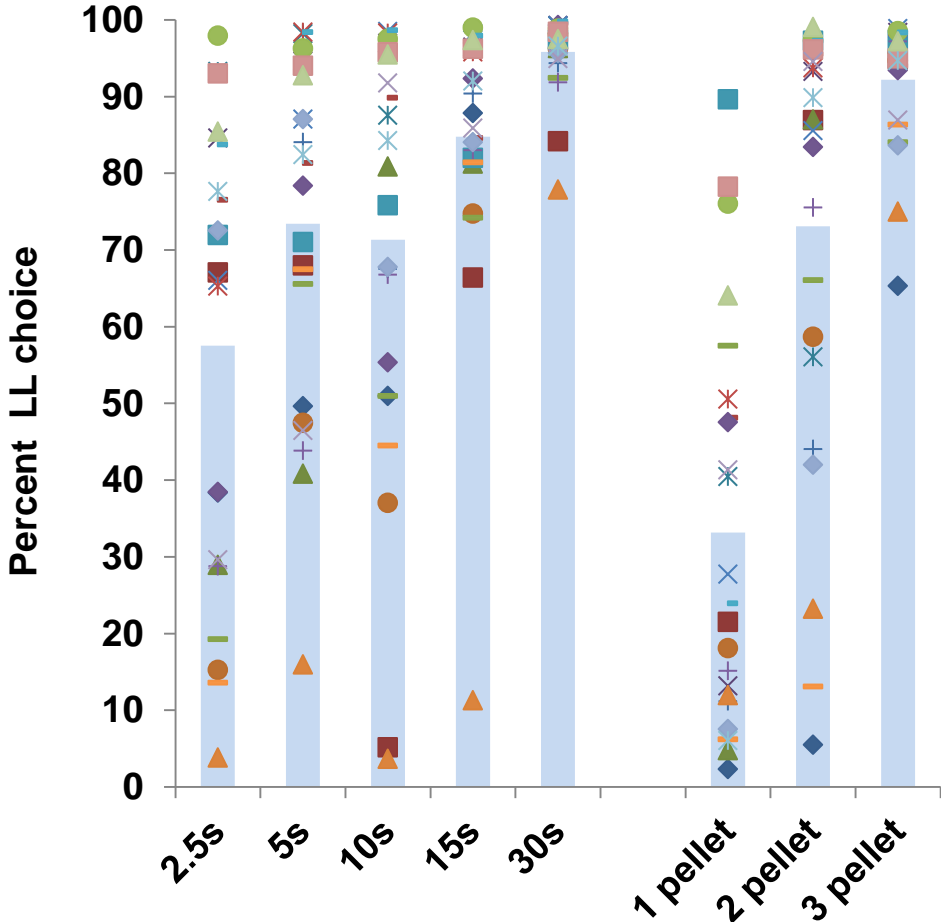
Between phase manipulations

Reward delay (SS)

<u>SS 1 pellet</u>	v	<u>LL 2 pellet</u>
2.5s	v	30s
5s	v	30s
10s	v	30s
15s	v	30s
30s	v	30s

Reward magnitude (LL)

<u>SS 10s</u>	v	<u>LL 30s</u>
1 pellet	v	1 pellet
1 pellet	v	2 pellet
1 pellet	v	3 pellet



Delay Magnitude

2.5s<5s+ 5s<30s 10s<15s+
1p<2p+ 2p<3p

Individual Differences in Reward Delay and Magnitude

Measure **reward timing** while keeping reward magnitude constant

Temporal discrimination (Bisection)

Measure **reward magnitude** sensitivity while keeping reward delay constant

Reward contrast

Correlate these measures to choice behavior

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Reward Delay Sensitivity

Temporal Discrimination

Signal 4s (Short) or 12s (Long)

Short – Response A – 1 pellet

Long – Response B – 1 pellet

Test with intermediate durations

Reward Delay Sensitivity

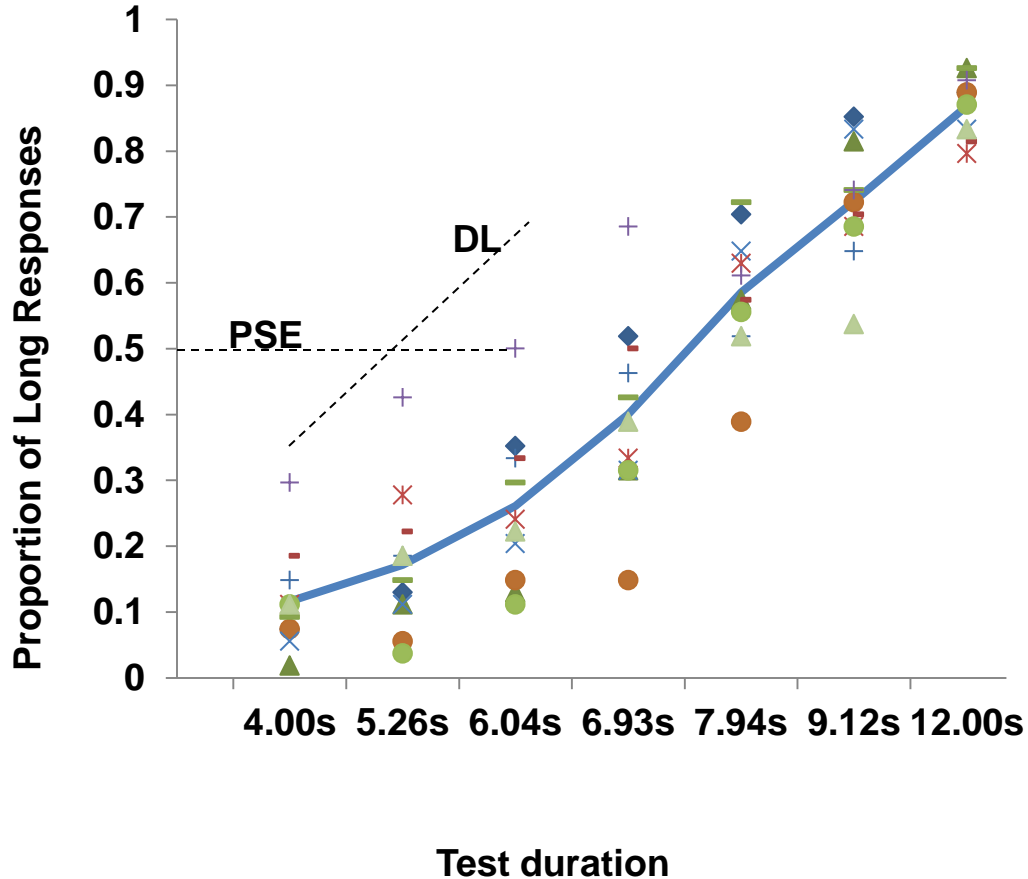
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Reward Delay Sensitivity

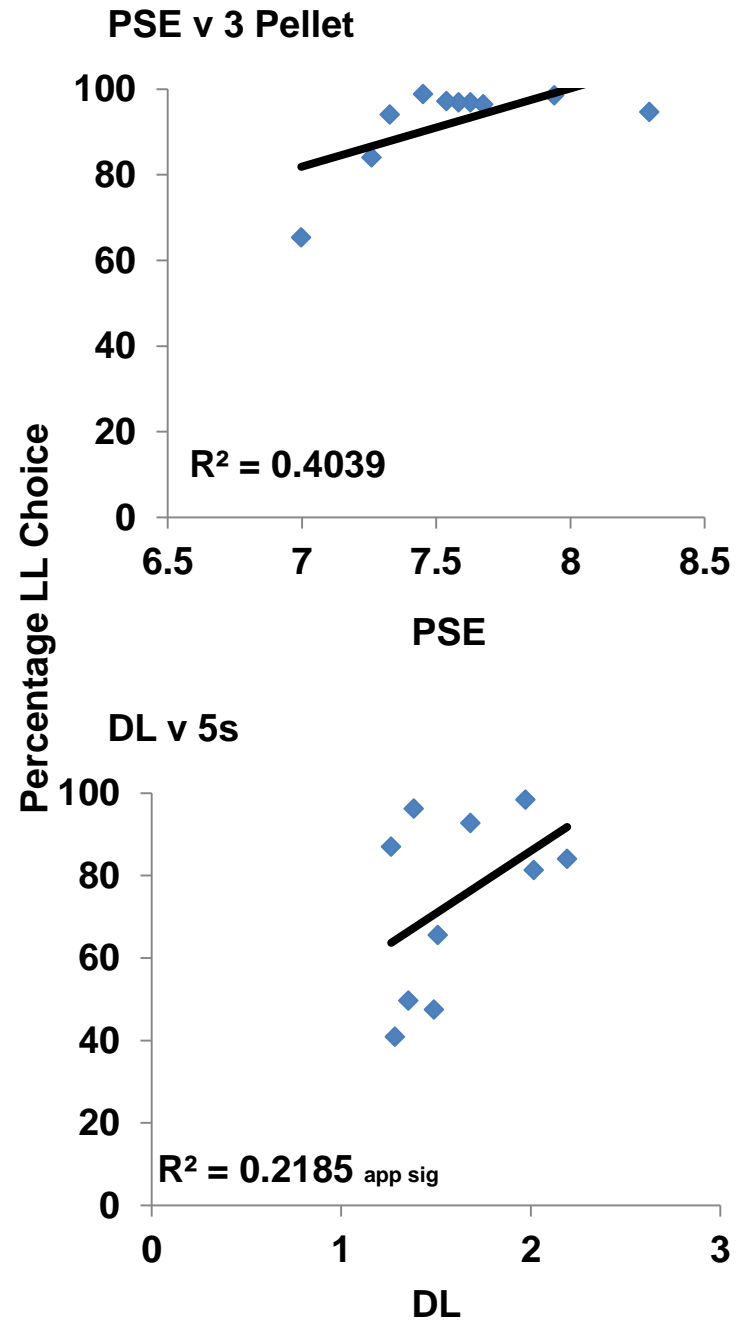
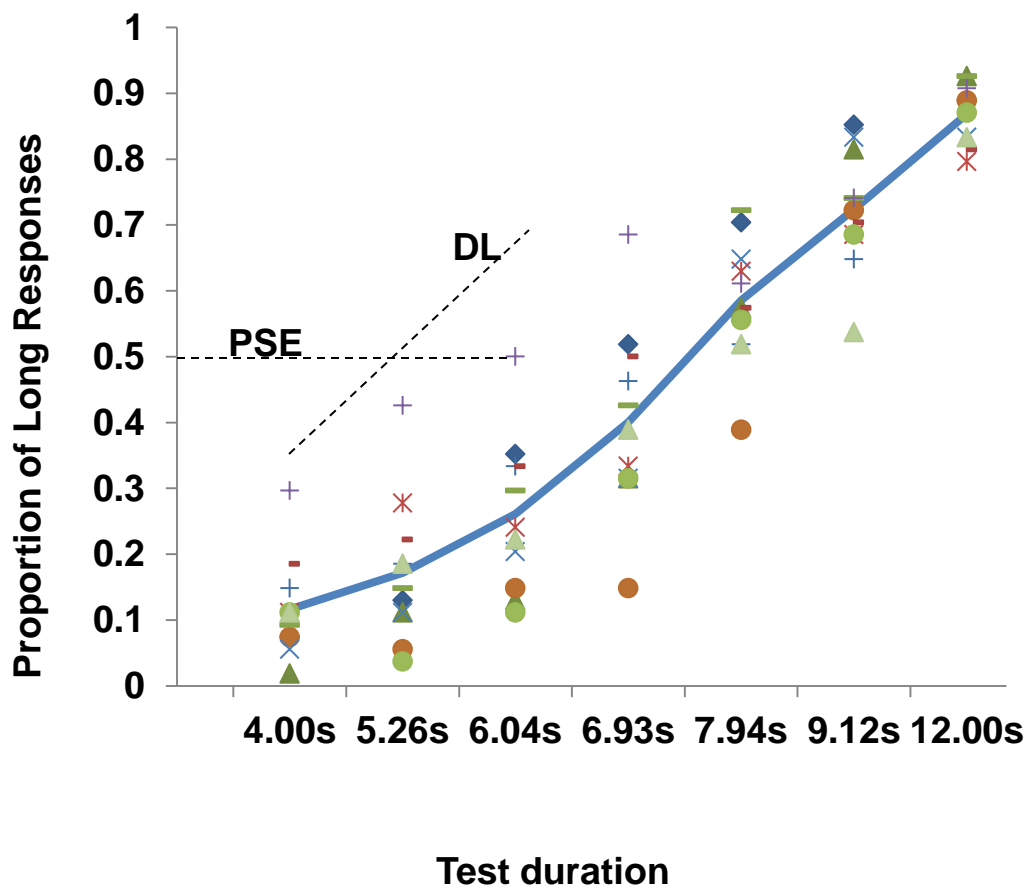
Temporal Discrimination

Signal 4s (Short) or 12s (Long)

Short – Response A – 1 pellet

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Test with intermediate durations



Reward Magnitude Sensitivity

Reward Contrast

Discrete trials: Small : Lever A inserted
 Large : Lever B inserted

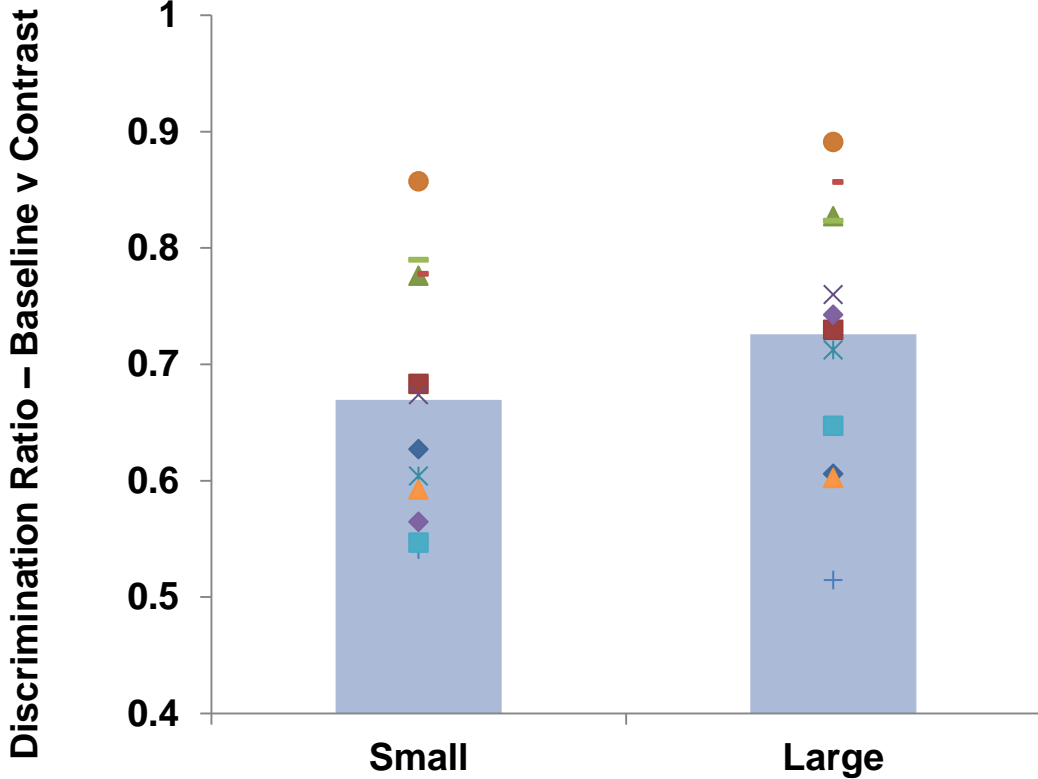
	Small	Large
Baseline Phase – VI30	1 pellet	1 pellet
Contrast Phase – VI30	1 pellet	4 pellet

Reward Magnitude Sensitivity

Reward Contrast

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 Large : Lever B inserted

 Small Large
Baseline Phase – VI30 1 pellet VI30 1 pellet
Contrast Phase – VI30 1 pellet VI30 4 pellet



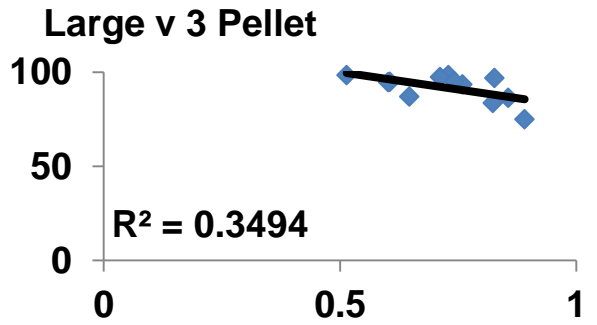
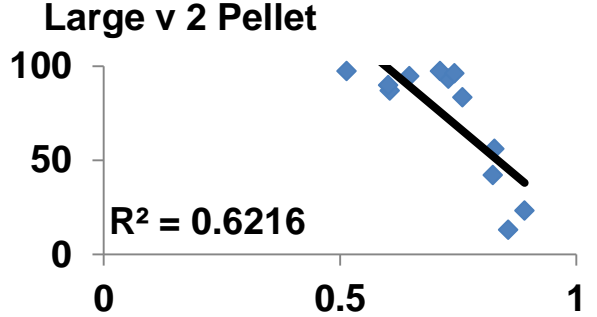
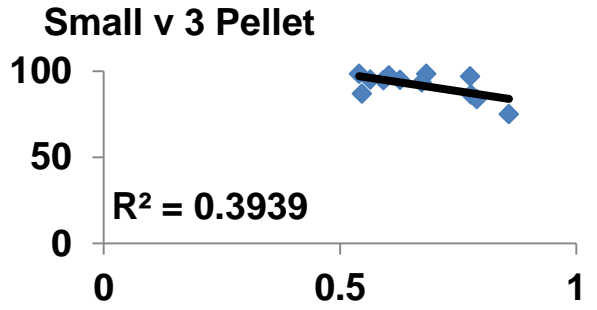
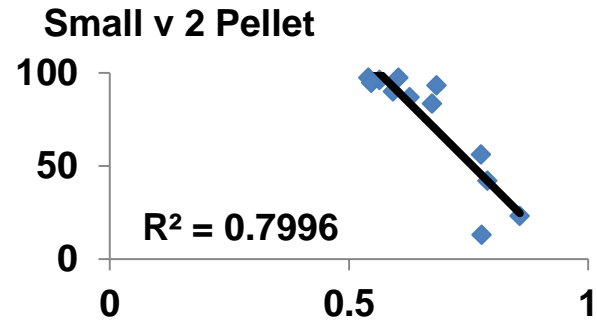
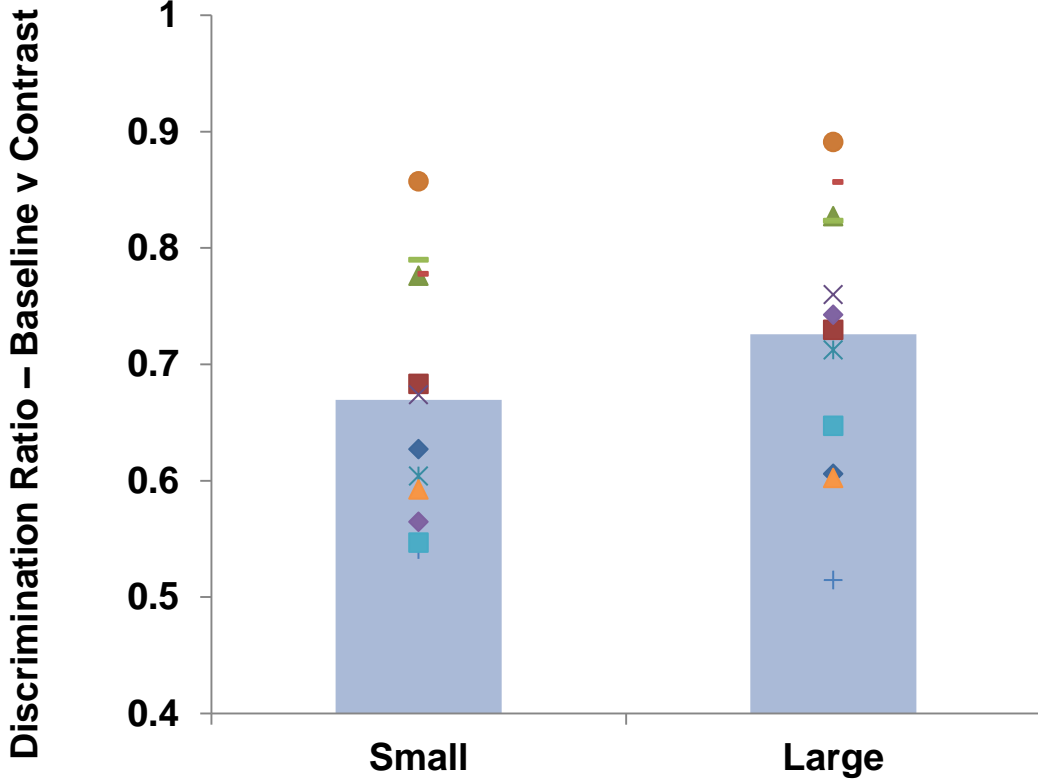
Reward Magnitude Sensitivity

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Small
 Baseline Phase – VI30 1 pellet
 Contrast Phase – VI30 1 pellet

Large
 VI30 1 pellet
 VI30 4 pellet



Discrimination ratio - Baseline v Contrast

Conclusions

Large individual differences in choice behavior in a standard population

Delay discounting is correlated to sensitivity to both reward delay and reward magnitude

Determining where the individual deficit lies – sensitivity to reward delay or reward magnitude - can be used as both a predictor of individual choice behavior and to develop intervention therapy for impulsive choice disorders