

Measure:	Delayed Reward Discounting (Monetary Choice Questionnaire)
Definition:	This measure assesses whether the participant prefers smaller immediate rewards over delayed larger rewards.
Description:	<p>The Monetary-Choice Questionnaire is a 27-item self-administered questionnaire. For each item, the participant chooses between a smaller, immediate monetary reward and a larger, delayed monetary reward. The protocol is scored by calculating where the respondent's answers place him/her amid reference discounting curves, where placement amid steeper curves indicates higher levels of impulsivity.</p> <p>For more information about the Monetary-Choice Questionnaire, please refer to the [link[www.cognitiveatlas.org/task/id/tsk_4a57abb949e98] Cognitive Atlas Interpretation]].</p>
Protocol:	<p><u>Monetary-Choice Questionnaire</u></p> <p>For each of the next 27 choices, please indicate which reward you would prefer: the smaller reward today, or the larger reward in the specified number of days.</p> <p>1. Would you prefer \$54 today, or \$55 in 117 days?</p> <p>[] smaller reward today</p> <p>[] larger reward in the specified number of days</p> <p>2. Would you prefer \$55 today, or \$75 in 61 days?</p> <p>[] smaller reward today</p> <p>[] larger reward in the specified number of days</p> <p>3. Would you prefer \$19 today, or \$25 in 53 days?</p> <p>[] smaller reward today</p> <p>[] larger reward in the specified number of days</p> <p>4. Would you prefer \$31 today, or \$85 in 7 days?</p> <p>[] smaller reward today</p> <p>[] larger reward in the specified number of days</p> <p>5. Would you prefer \$14 today, or \$25 in 19 days?</p>

☐ smaller reward today

☐ larger reward in the specified number of days

6. Would you prefer \$47 today, or \$50 in 160 days?

☐ smaller reward today

☐ larger reward in the specified number of days

7. Would you prefer \$15 today, or \$35 in 13 days?

☐ smaller reward today

☐ larger reward in the specified number of days

8. Would you prefer \$25 today, or \$60 in 14 days?

☐ smaller reward today

☐ larger reward in the specified number of days

9. Would you prefer \$78 today, or \$80 in 162 days?

☐ smaller reward today

☐ larger reward in the specified number of days

10. Would you prefer \$40 today, or \$55 in 62 days?

☐ smaller reward today

☐ larger reward in the specified number of days

11. Would you prefer \$11 today, or \$30 in 7 days?

☐ smaller reward today

☐ larger reward in the specified number of days

12. Would you prefer \$67 today, or \$75 in 119 days?

☐ smaller reward today

☐ larger reward in the specified number of days

	<p>13. Would you prefer \$34 today, or \$35 in 186 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>14. Would you prefer \$27 today, or \$50 in 21 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>15. Would you prefer \$69 today, or \$85 in 91 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>16. Would you prefer \$49 today, or \$60 in 89 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>17. Would you prefer \$80 today, or \$85 in 157 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>18. Would you prefer \$24 today, or \$35 in 29 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>19. Would you prefer \$33 today, or \$80 in 14 days?</p> <p><input type="checkbox"/> smaller reward today</p> <p><input type="checkbox"/> larger reward in the specified number of days</p> <p>20. Would you prefer \$28 today, or \$30 in 179 days?</p> <p><input type="checkbox"/> smaller reward today</p>
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☐ larger reward in the specified number of days

21. Would you prefer \$34 today, or \$50 in 30 days?

☐ smaller reward today

☐ larger reward in the specified number of days

22. Would you prefer \$25 today, or \$30 in 80 days?

☐ smaller reward today

☐ larger reward in the specified number of days

23. Would you prefer \$41 today, or \$75 in 20 days?

☐ smaller reward today

☐ larger reward in the specified number of days

24. Would you prefer \$54 today, or \$60 in 111 days?

☐ smaller reward today

☐ larger reward in the specified number of days

25. Would you prefer \$54 today, or \$80 in 30 days?

☐ smaller reward today

☐ larger reward in the specified number of days

26. Would you prefer \$22 today, or \$25 in 136 days?

☐ smaller reward today

☐ larger reward in the specified number of days

27. Would you prefer \$20 today, or \$55 in 7 days?

☐ smaller reward today

☐ larger reward in the specified number of days

Scoring

A participant's discounting curve may be calculated according to the following function:

$$V = A/(1+kD)$$

V is the present value of the delayed reward A at delay D , and k is the rate of discounting. k typically falls between 0.0 and 0.5, with smaller values indicating a lack of discounting and preference for delayed rewards and higher values indicating strong discounting and a preference for immediate rewards. Thus higher values of k are indicative of high levels of impulsivity.

There are two ways of scoring the Monetary-Choice Questionnaire. The first involves hand scoring to get an estimate of k following the guidelines given in Kirby (2000). The second involves fitting a logistic regression function to individual responses following procedures described in Wileyto et al. (2004).

Estimating Discounting Rate

The following table lists the calculated k values (the degree of discounting) at indifference for each question (i.e., when the subjective value of the immediate and delayed rewards are equivalent).

Question	k at indifference
13	.00016
1	.00016
9	.00016
20	.00040
6	.00040
17	.00040
26	.0010
24	.0010
12	.0010
22	.0025
16	.0025
15	.0025
3	.0060
10	.0060
2	.0060
18	.016

	21	.016		
	25	.016		
	5	.041		
	14	.041		
	23	.041		
	7	.10		
	8	.10		
	19	.10		
	11	.25		
	27	.25		
	4	.25		
	An estimate of the respondent’s discounting rate can be calculated as the geometric mean (to avoid underweighting) of the <i>k at indifference</i> between the two questions that reflect when the respondent changes between choosing the delayed reward versus the immediate reward. In cases where the respondent’s change between preferring the delayed versus the immediate reward is not consistent, the two questions that are most proportional to their responses are chosen. If the participant always chooses the immediate reward or the delayed reward, the estimation of <i>k</i> is equal to one of the endpoints (0.25 or 0.00016).			
Selection Rationale:	Delayed Reward Discounting has been shown to be moderately associated (<i>d</i> ~ .4-.6) with a broad range of addictive behaviors and can predict initiation of substance use (MacKillop et al., 2011; Audrain-McGovern et al., 2009). The Monetary Choice Questionnaire has been shown to be temporally stable, has been used with adolescents, and is highly correlated (<i>r</i> = 0.82) with computer-based experimental methods.			
Source:	Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. <i>Journal of Experimental Psychology: General</i> , 128, 78-87.			
Life Stage:	Adolescent Adult			
Language of source:	English			
Participant:	Adults and adolescents aged 13 years or older			
Personnel and Training Required:	None			
Equipment Needs:	None			
Standards:	Standard	Name	ID	Source

	Common Data Element (CDE)	Neurobehavioral Delayed Reward Discounting Assessment Score	3346937	CDE Browser
General references:	<p>Audrain-McGovern, J., Rodriguez, D., Epstein, L. H., Cuevas, J., Rodgers, K., & Wileyto, E. P. (2009). Does delay discounting play an etiological role in smoking or is it a consequence of smoking? <i>Drug and Alcohol Dependence</i>, 103(3), 99-106.</p> <p>deWit, H. (2008). Impulsivity as a determinant and consequence of drug use: A review of underlying processes. <i>Addiction Biology</i>, 14, 22-31.</p> <p>Epstein, L. H., Richards, J. B., Lerman, C., Saad, F. G., Paluch, R. A., & Roemmich, J. N. (2003). Comparison between two measures of delay discounting in smokers. <i>Experimental and Clinical Psychopharmacology</i>, 11, 131-138.</p> <p>Fernie, G., Cole, J. C., Goudie, A. J., & Field, M. (2010). Risk-taking but not response inhibition or delay discounting predict alcohol consumption in social drinkers. <i>Drug and Alcohol Dependence</i>, 112(12), 54-61.</p> <p>Kirby, K.N. (2000). Instructions for inferring discount rates from choices between immediate and delayed rewards. Unpublished manuscript.</p> <p>Kirby, K. N. (2009). One-year temporal stability of delay-discount rates. <i>Psychonomic Bulletin & Review</i>, 16(3), 457-462.</p> <p>Lawyer, S. R., Schoepflin, F., Green, R., & Jenks, C. (2011). Discounting of hypothetical and potentially real outcomes in nicotine-dependent and non-dependent samples. <i>Experimental and Clinical Psychopharmacology</i>, 19(4), 263-274.</p> <p>MacKillop, J., Amlung, M. T., Few, L. R., Ray, L. A., Sweet, L. H., & Munafo, M. R. (2011). Delayed reward discounting and addictive behavior: A meta-analysis. <i>Psychopharmacology</i>, 216(3), 305-321.</p> <p>Wileyto, E. P., Audrain-McGovern, J., Epstein, L. H. & Lerman, C. (2004). Using logistic regression to estimate delayed-discounting functions. <i>Behavior Research Methods, Instruments, & Computers</i>, 36(1), 41-51.</p>			
Mode of Administration:	Self-administered questionnaire			
Derived Variables:	None			
Requirements:	Requirement Category			Required
	Major equipment			No
	Specialized training			No

	Specialized requirements for biospecimen collection	No
	Average time of greater than 15 minutes in an unaffected individual	No
Process and Review:	The Expert Review Panel has not reviewed this measure yet.	