Python Discounting Task Manual

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Link to program and associated files, including this manual: https://goo.gl/U3vcCy

What awaits you here

Within these folders are two discounting programs I've written in the python programming language that I've made available for use. Both tasks depend on a number of python add-on modules as well. All of these are free and I've uploaded the files here for your use. Before you use either discounting task, install python and the associated modules.

Python installation instructions

System requirements:

- A Windows computer. I'm not sure what the minimum system requirements are, but they're minimal. You won't need a very fast computer.
- A display with a horizontal resolution of at least 1024 pixels (this includes essentially all monitors and displays).
- A user account with administrator privileges.

Python and all of the necessary dependencies are in the "Install first", "Install second", and "Install third" folders, each of which contains one or more executable files. Each of these executable files should be separately installed in the order indicated by the folder names. Installation programs within a folder can be installed in any order. Files can be downloaded one at a time and installed, or entire folders can be downloaded at once. If you download a whole folder, OneDrive will automatically compress it as a .zip file and you will need to extract the files within before installing them.

Note: On some computers, errors are generated during installation of some of the python modules. If you get this, just click 'ok' or 'continue' or whatever and don't worry about it. I'm not sure what causes these errors, but they don't seem to interfere with the tasks.

The "minute discounting" task

This task is described in this paper as the 5-question adjusting delay task: Koffarnus, M. N., & Bickel, W. K. (2014). A 5-trial adjusting delay discounting task: Accurate discount rates in less than one minute. *Experimental and Clinical Psychopharmacology, 22*(3), 222-228. doi: 10.1037/a0035973

You can find a .pdf of this paper in this shared folder. The task is a short delay discounting task that provides an estimate of an individual's discount rate (k) and effective delay 50% (ED50) in 5 discrete-

choice questions. This task takes usually takes about 40 seconds to complete and is in the "Minute discounting" folder.

Once you have python installed as directed above, there is no installation needed for this task. Download the files in the "Minute discounting" program and put them anywhere you'd like including on removable media or a network shared drive. The main script (Minute discounting everything.py) requires two files to run properly: delays.dat and probabilities.dat, so keep all of these in the same location. I wrote this program to be flexible with a lot of settings, which you will be prompted to enter when you start it by double clicking on the 'Minute discounting everything.py' script. Included in the folder is another optional script ("Minute starter.py") that can be edited and used to automate the running of the main script with a given set of parameters that meet your needs. There are some brief instructions within this script and it can be edited with any plain text editor like Notepad (I recommend Notepad++ though, which is a free program). In python scripts, everything after a # sign in a given line is a comment that I've included to describe how to edit the script. Here is a brief overview of the settings that you will be prompted with at the start of the task and can set in the starter script. After ID and session name, all of these replicate common forms of discounting tasks found in the literature, and each response should be one of the numbers in the brackets:

- Subject ID: Put whatever you want here to identify the subject, but limit yourself to the first ASCII 128 characters and don't use characters that cannot be used in windows filenames (i.e., ~, *, #, %, &, *, {, }, \, :, <, >, ?, /, +, |, or ").
- Session: Put whatever you want here too with the same character limitations as above.
- Commodity with unit: This should be the thing that is being discounted. If you want to use money, just put a dollar sign ($). The same character limitations above apply.
- Delayed or probabilistic amount: Put the larger-later amount here. This should be a number (decimals are ok).
- Delay [0] or probabilistic [1] discounting: Put a 0 if you want delayed discounting, put a 1 if you want probability discounting.
- Gains [0] or losses [1]: This will determine if the task presents the participant with gains of the commodity [0], or losses of that commodity [0].
- Future [0] or past [1] events: This only applies to delay discounting. Discounting of future, delayed events is more common [0], but discounting of events that occurred in the past can also be selected [1].
- Implicit [0] or explicit [1] zero: Implicit zero [0] is the default here and will present choices between two amounts of money, one immediate and one delayed. Explicit zero [1] reframes the questions so the same amounts and delays are used, but informs the participant that none of the commodity will be received at the delay not chosen.
- Individual [0], Social Me-Me [1], Social Me-We [2], Social We-Me [3], Social We-We [4] discounting: Individual [0] discounting is the default and doesn't modify the task. The various social options present the user with a choice between the commodity received for yourself now or yourself later [1], yourself now or a group of people later [2], a group of people now or yourself later [3], or a group of people now or a group of people later [4].

Adjusting amount task

My adjusting amount discounting program can be found in the "Adjusting amount discounting" folder. We've used this task in a number of studies including as the comparison task to the minute discounting task in the paper cited above. The algorithm for the task was developed by others and is described in this paper: Du, W., Green, L., & Myerson, J. (2002). Cross-cultural comparisons of discounting of delayed and probabilistic rewards. *Psychological Record, 52*(4), 479-492.

This task is self-contained and requires no other files to run (given that python is installed as described above). The script "AdjAmt discounting everything.py" operates similarly to the Minute task and can be run from anywhere. It also contains a number of options that will need to be set at the beginning of each task run, and can be automated with the optional "Everything discounting starter.py", edited for your needs. The settings are all the same as for the Minute Discounting Task above and follow the same rules, except for these:

- Cross-commodity discounting [y/n]: The answer to this should be a 'y' or an 'n'. If you select 'y', then the task will be a cross-commodity one where the immediately available and delayed commodities can be different. If you select this, you will need to specify separate immediate and delayed commodities and amounts. The amounts you specify should be the amount that you want to be discounted for the delayed commodity and the equivalent amount for the immediate commodity. You'll need to determine this equivalent amount separately.
- Custom delays or probabilities [y/n]: Put 'n' here to use the standard delays. If you want to use different delays, put 'y' here and enter the delays you want in the next few prompts exactly in format described in the prompts.

Frequently Asked Questions

Q: What instructions do you read to participants?
A: This varies somewhat depending on the specific experiment and task parameters, but here is an example of instructions for monetary discounting tasks with future gains:

> *"You will now complete a series of decision-making tasks. You will be asked to make choices between different amounts of money given to you now or after a delay. These are hypothetical choices, but please choose your answer as if the items were to be delivered as described. Each task will start with some brief instructions on the screen. Read these instructions, and press the 5 key on the keyboard when you are ready to begin. There are no right or wrong answers in the tasks, just choose which option you prefer in each case. Please take your time and answer thoughtfully. To select the option on the left side of the screen, press the left arrow, and to select the option on the right side of the screen, press the right arrow."*

Q: How do I make responses?
A: Press the 1 key or the left arrow on your keyboard to choose the left option and the 6 key or the right arrow for the right option.

Q: How can I stop the task?
A: To stop either task before it is complete, press the Escape key on your keyboard.

Q: How is the session data stored?
A: When you run either task, it will create a 'data' subfolder in the location that the task is run, and a subfolder within that matching the current subject ID (for this reason, you should only use characters in your subject IDs that can be used in Windows file and folder names). Data files for each Subject ID will be stored in their own folder, which will be automatically created by the programs if they're not already there. Both tasks store data files within these folders for each task run as .csv files. This file type is a text file of comma-separated values and can be opened in Excel. Each data file contains some session information at the top of the file, trial-by-trial choice information for each choice trial, and session summary information at the bottom. For the minute task, this summary information includes the k value (discounting rate) and ED_{50} (effective delay 50) values. For the adjusting amount task, this summary information includes indifference points at each delay (expressed as a proportional value relative to the larger later amount), k value determined by nonlinear regression fit of Mazur's (1987) discounting function through the indifference points, and rule violations of the rules proposed by Johnson and Bickel (2008, Experimental and Clinical Psychopharmacology, 16, 264-274). The number that appears after "JB1" refers to the number of violations of the "bounce" criterion proposed in that paper and the number by "JB2" indicates whether the proposed "trend" criterion was violated. Whether either of these criteria were violated also appears on the screen at the end of the task.

Q: I'm using a Mac and this doesn't work.
A: Although Python works on Windows, Mac, and Linux, these programs are Windows specific.

Q: For the minute discounting task, is that 'minute' as in 60 seconds or 'minute' as in really small?
A: I intended it to be the 60 seconds one, but I guess both work. The reviewers made me change it anyway, so now it's '5-trial adjusting delay discounting task'.