

Background

The Peabody picture vocabulary task (PPVT) is a widely used task to measure a person's receptive vocabulary, originally designed by Lloyd Dunn and Leota Dunn (Dunn, Dunn, Bulheller, & Häcker, 1965). It measures whether a person can match a spoken word to one out of four pictures, and is hence comparable to a multiple choice task. Words become increasingly more complex over the course of the task. Each person starts with a set that is appropriate for one's age, and continues until (s)he makes too many errors. It is a normed task from children as young as 2;3 up to 90 years. From its original version in 1965, the task has been updated several times for the American-English version because some items became outdated or required new norming, but the logic and procedure stayed the same. The PPVT has also been translated into many languages. The task used in YOUth follows the Dutch adaptation: Peabody Picture Vocabulary Test-III-NL ('PPVT 3-NL', Schlichting, 2004). It is used in all our waves from R3 onwards.

Procedure in YOUth

Although the PPVT is designed as a behavioral task (e.g., to have the subject pointing to one image and the experimenter scoring responses manually while (s)he is also producing the target words verbally) we created a computerized version of the PPVT 3-NL. In this way we could control for speaker pronunciations, minimize the role of the experimenter, and allow for automatic scorings. Note that we have explicit approval from Pearson Publishers and the Dunn family to develop this computerized version.

The PPVT 3-NL has in total 204 words, divided in 17 sets of 12 items each. Based on a child's age the task begins with a predefined set ("instap set"). If the child makes 5 or more errors in the start set, the computer then switches (if possible) to an earlier set until the child makes less than five errors ("start set"). The final set is the set in which the child makes nine or more errors ("afbreek set"). The program registers the responses (as correct or incorrect) and reaction times a child has made from the start set to the final set. A summary file documents which sets formed the begin set ("instap set"), the "start set" and the final set "afbreek set" as well as the number of errors made and this child's raw score. A child's raw score is calculated as: 'Maximum score (e.g., 12 * "afbreek set") - Number of errors'. For instance, if your final set ("afbreek set") is 14, and you made 34 errors, this gives you a raw score of $14 * 12 - 34 = 134$. Based on the child's age you can then impute how this raw score translates to a child's language quotient and percentile. The PPVT3 -NL from 2004 has created norms at 3-months intervals based on 1746 children (range: 2;3 – 15;11 years) and at 6-months intervals based on 1164 adults (range 16 – 90 years; cf. Schlichting 2004). Using again the example of the raw score of 134, this score represents a receptive vocabulary of a typical children aged 12; 6.

The task has been programmed by our programmer Roy van Koten (in Matlab R2018a for R3; in Matlab 2015a/ 2017b for R9) using Psych-Toolbox 3 (Brainard & Vision, 1997). We use a touchscreen version for our Infant and Child waves (i.e., R3 and R6: touch screen is Dell S2240T 23.5"; operating system: macOS High Sierra), in which children touch the correct image while the experimenter plays the words. We use a computer version for our Child & Adolescent waves (i.e., R9, R12 and R15) in which children first listen to the words through headphones (Hama HK-5618,) and select the correct image via a mouse (Dell MS116

optical mouse). Each word is generally presented just once, but we build in the option to present one other token of this word upon the child's request.

Instructions and Set-up per wave

Following the guidelines in PPVT 3-NL we have also slightly different instructions and set-ups depending on the age of the child.

For children in the Infant and Child cohort (using the touch screen version), the experimenter stays with the child throughout the task. When parents are present as well, they are explicitly instructed to not interfere or give any type of feedback. There are two practice trials: in the first, each picture is labeled explicitly, and in the second none of the pictures are labeled any more. The experimenter presents the first practice trial and introduces the task as follows: "we are going to see all kinds of pictures. Look, there is a spoon, a ball, a banana, and a dog". When she labels the pictures, she also points to each of the pictures. Then she says: "Now you will hear a word, and you can point to the correct picture". Let's try. Listen carefully". She then plays the first audio file. This time the target word is in a carrier sentence: 'point to the spoon'. The experimenter also says: "point to it!". If the child points correctly, the experimenter says "well done!". If the child does not respond, or not respond correctly, the experimenter can repeat playing the same sound file multiple times, and if necessary, also guide the child's arm movements. (If at this stage the child refuses to cooperate, the task is aborted.) When the child has answered correctly, the experimenter presents another sound file that matches one of these pictures. From now on, words are presented in isolation rather than in carrier sentences ("hond"; 'dog'). The child can practice with each of the four words until the child has given two correct responses. Then the second practice trial appears (depicting sleeping/crying/eating/crawling), and the experimenter says "look, more pictures. Now you will hear a word, and you can point again to the correct picture". She then presents the word "slapen" 'sleeping'. If the child responds correctly, she says "well done"; otherwise, they continue to practice with the remaining items until the child has given two correct responses (or eventually aborts the task). Then the task can begin while the experimenter explains: "look, more pictures will appear. Now you will hear each time a word, and you can point to the correct picture. At first, words are easy. At the end some words will be very difficult. You do not need to know all words! If you do not know a word, just point to a picture". Throughout the task the experimenter frequently gives encouraging but neutral feedback such as 'yes', 'okay', 'and now...'. If the child stops pointing, she might say "where is it?". If the child finds it really difficult, the experimenter can say "that was a difficult word". For each trial, the experimenter decides when to play the sound file, and whether it is necessary to play a second token of the word a little later. If the child points to the screen, but does not touch the screen, the experimenter can mimic the child's responses via her keyboard.

For children in the Child & Adolescent waves the experimenter is only present during the instruction. She gives the following instructions: "We are going to carry out a task that examines how many words you can understand. Each time you see four different pictures and hear one word. Select the picture that best matches the word you heard. Let's try this first". The child then sees two different types of practice trials. In the first trial the experimenter explicitly labels the four pictures (a kite, a ball, a chicken and a dress). The experimenter then presses to present the auditory word ("kip"; 'chicken'), and asks the child to select the correct picture. If the child would like to hear the word one more time, (s)he could select the small symbol of a loud speaker present on the top left of the screen. If the child answers incorrectly

or would like to try this practice trial one more time, the experimenter now plays a different word from the same picture set (“vlieger”, ‘kite’); otherwise they move to a new practice set. In this second practice set (showing cleaning, cycling, lawn mowing and painting), the experimenter no longer explicitly labels the pictures, but says “Look, there are more pictures. Now you’ll hear a word and then you select the best picture”. This trial plays the word “fietsen”, ‘bicycling’. Again, if the child makes an error or would like to practice again, there is the option to play a different word that matches one of the other pictures from the same four pictures already present on the screen (e.g., “schoonmaken”, ‘cleaning’). When the child has indicated that (s)he understood the procedure, the experimenter then starts the task and says: “now many more pictures will appear. We begin with words that match your age. Slowly the task gets more difficult. Let’s see how many words you understand. Always select a picture, even when you do not know the word, or when the right picture is not present. I will now move out of your sight, but you can call me when the task is finished”. The child is then instructed to wear head phones and the experimenter starts the task. For each trial, first the four pictures are presented, and then the soundfile matching one of the words is played automatically two seconds later.

Stimuli

Visual stimuli

The visual stimuli are the original black and white drawings digitized from PPVT 3-NL. They appear in quadrangles around 96 x 120 mm on a 23.5 inch screen.

Auditory stimuli

We recorded several tokens of each target word in a soundproof booth (<https://uilots-labs.wp.hum.uu.nl/cabins/cabin-1/>) from a native female 33-years-old speaker (“S.B.”) who spoke the words clearly and slowly in standard Dutch (Algemeen Beschaafd Nederlands). In total there were 220 words (204 target items plus 16 practice words). Recordings were made in Audacity 2.0 and sampled to disk at 44.1 kHz mono. I (Caroline Junge) then used Praat 5.4.08 (Boersma & Weenink, 2015) to segment and store the individual words as separate wav.files. For each target word, we selected two different tokens. Each token was checked for clippings, normalized (e.g., adjusted its mean intensity) to 65 dB, and stored with an additional 100-ms silence inserted before and after the actual token.

References

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