



Denis Pelli &lt;dp3@nyu.edu&gt;

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**RE: critical spacing program**

1 message

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**Waugh, Sarah** <Sarah.Waugh@anglia.ac.uk>  
To: "denis.pelli@nyu.edu" <denis.pelli@nyu.edu>

Fri, Dec 11, 2015 at 12:30 PM

Good points. All started with Sheridan Gardiner who found that E test was difficult for under 7 years in that up-down laterality developed before L-R laterality so resulted in inequality, and wanted to use letters for testing. They looked at what letters were most easily identified (and copied) by very young children they came up with a selection of 9 letters: HOTVXCLUA. Looking into it a little it appears that a reason for using reversible letters was that easier to develop rapport with young children using closer distance than 6m, so use of mirror, so use of reversible letters!

They then found that testability improved if eliminated A <5years. All normal 4 year olds could do HOTVXCL. Remove CL for mirror. So HOTVX.

80% testability for 3 year olds if eliminated X (as they often confused X and V – so could have chosen to eliminate V).

30% testability for 2 year olds if use HOTV.

So it came down to testability, use of mirror and lower consistency of responses at 3m with directional letters in 3 year olds, and the fact that in delayed development and dyslexics, directional difficulties lasted for longer than in normal children. Matching helps, but doesn't eliminate this difficulty. We obviously don't have problem with needing to use a mirror.

Happy to first try with Sloan set. Will have HOTVX set at the ready should there be early indication of difficulty with Sloan. HOTV probably also works well simple due to reduced number of choices provided. Clinically, for some young children, symbols work better. Perhaps this is because they are aware of the existence of letters being for bigger people, so would be worth considering Lea/Patti Pics version. Some may find the presence of so many symbols/letters too confusing, even if repeated. We don't know how they will deal with this yet. We do have children in clinic where we have to resort to single letters without any surround (as usual format is either CC or line of 4-5 letters/symbols with box) as they find these formats too confusing – either developmentally delayed, autistic etc. It is better than nothing but I think single letters or symbols surrounded by bars at right place give very nice crowding effects (not yet published).

All for now. Will try to download program. Thanks for mods. I am sure they are fab.

Have a nice weekend.

Best,

Sarah

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**From:** Denis Pelli [mailto:[denis.pelli@nyu.edu](mailto:denis.pelli@nyu.edu)]

**Sent:** 11 December 2015 16:01

**To:** Waugh, Sarah

**Subject:** Re: critical spacing program

dear sarah

i modified the program to allow specification of an arbitrary border letter. it prevents you from using the same letter as border and in your alphabet.

looking at the symmetric letters that look good in Sloan, we could use: HOTVXAY. Is there some reason to omit AY? I don't get the rationale for using symmetric letters. Yes, I understand that kids make left right reversals so they might confuse letters that differ solely by left-right reversal. But surely they'll know that a K on the screen matches a K on the piece of paper? Do you really think that children will perform better with HOTVX than with DHKNORSVZ? There is a substantial benefit to using the same test at all ages.

This produces the standard adult condition:

```
o.alphabet='DHKNORSVZ'; % Sloan alphabet, excluding C
```

```
o.borderLetter='X';
```

And this produces the HOTVX condition:

```
o.alphabet='HOTVX'; % alphabet of Cambridge Crowding Cards
```

```
o.borderLetter='N';
```

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On Thu, Dec 10, 2015 at 7:08 PM, Waugh, Sarah <[Sarah.Waugh@anglia.ac.uk](mailto:Sarah.Waugh@anglia.ac.uk)> wrote:

Not a problem re dinner or not. Yes HOTV easy as you say and maybe other Sheridan Gardiner letters. Can't remember off top of head why other S-G letters were excluded but will read up. As you say any letters easily added.

Hope your (current) dinner is enjoyable.

Best

Sarah

Sent from my iPhone

On 10 Dec 2015, at 23:16, Denis Pelli <[denis.pelli@nyu.edu](mailto:denis.pelli@nyu.edu)> wrote:

dear sarah

thanks. the discussion of optotypes is helpful. given our time constraints HOTVX seems very attractive. You can change that yourself in the script file. Just replace the current "DHKNORSVZ" by "HOTVX". However, currently there is no way to control what the

margin character is (currently "X"), so i'll improve the program tonight to allow specification of the margin character.

running to a dinner now.

meeting up for a coffee/drink in cambridge would be great. i don't know if i'll be free for dinner. haven't yet figured out plans with horace.

best

denis

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On Thu, Dec 10, 2015 at 5:23 PM, Waugh, Sarah <[Sarah.Waugh@anglia.ac.uk](mailto:Sarah.Waugh@anglia.ac.uk)> wrote:

Hi Denis,

Of course I'd love to see you on 22<sup>nd</sup> December! Be a great opportunity to iron out wrinkles and many things to talk about. Could bring my mac to meet up for a drink somewhere and talk about work and then carry on to dinner if you would like – if you have time after work with Horace? What time will you need to head back to London? (I'll admit I saw you were invited to AVA in London but I can't go and was hoping you might swing by this way...)

Will hope to download your new version tomorrow. Teaching in morning, but will then want to try if at all possible.

First version, I road-tested on 16 year old a couple of times; funnily enough realised n=20 (new 40) would take too long for children, but had (very intelligent) 6 year old child for colour test Monday morning and they obliged. Managed to encourage them to finish whole thing (new 40), but for some reason could only find saved data for non-

repeated (it did repeated; then non-repeated). Was kicking myself and not sure why it happened – letters did go quite big once or twice, but haven't been able to make it save only half a run again! Anyhow that would have been so nice to have a 6 year old – just received ethics for normal kids on Monday too. Then road-tested half number of trials on 16 year old to see if outcomes were similar to longer (and they were close enough) so had already decided to do this on any other kids – had to bribe the 6 year old with sweets etc to get him though and he was competitive, intelligent etc. Anyhow the good news is I can now try to get kids, but end of term and no time to catch them... maybe next week will be easier (last week of term).

So Sloan should work down to 5ish (year's old) and some younger too, but then Lea (or Patti Pics) may be the way to go. (Possibly a HOTV/X version would be helpful too as these are letters used on most paed charts due to vertical symmetry and so even 5-7 year olds find these much easier). To create electronic Lea, we scanned in printed version and cleaned up and checked sizes etc. on computer. Now wondering if we should have gone with Patti Pics as they are simpler in that they use 1 stroke-width to 5 for overall symbol size; whereas Lea work out to 1:7 on average with some slight differences for different shapes (so fiddly to replicate). Lea are good as they scaled them to provide similar acuities to Bailey-Lovie. Have now seen abstracts stating Lea provide more similar repeatable acuity; but another saying Patti-pics do – so guessing they are close. In the UK, Kay pictures are popular, but we find Lea behave more like letters for acuity and for crowding than do Kay (quite interesting) so I think for the young ones we go for Lea or Patti-Pics. There are 4 Lea and 5 Patti Pics. Monika and I have been working with Lea too as we compare to HOTV (4) and so Lea (4) made sense (we also used HOTV in CC arrangement). Actual Cambridge Crowded Cards use HOTVX (5) so Patti Pics would also make sense if we go this way. I am guessing PEDIG group have electronic Lea or Patti Pics, or Lea herself... haven't tried to ask before.

There is a niggle to do with extent that I need to get my head around – but I know there are notes with program I need to read before and re-read Song et al, before I can confirm if a niggle or not. Will try to find time this weekend to sort this out, but unfortunately being end of term with many other jobs needing doing before end of next week (our last teaching week) time is very tight. Going to Oxford on Sunday to collect son as well. Having Australian visitors arriving from 23<sup>rd</sup> December.

I too would like to send you some data for the publication – will do my best.

Stay in touch.

Best,

Sarah

**From:** Denis Pelli [mailto:[denis.pelli@nyu.edu](mailto:denis.pelli@nyu.edu)]

**Sent:** 10 December 2015 16:51  
**To:** Waugh, Sarah  
**Subject:** Re: critical spacing program

dear sarah

great!

i'm attaching a newer version which has more comments in the run script and simplified the trial count. now we count each response as a trial, which is what matters for Quest and threshold estimation. Each repeated-letter presentation yields two responses, and thus two trials. So you can pick one number for "o.trials" and leave it at that. Use 40 when you have time and 20 if you're in a rush.

you might need to re-enable the encouragement, which is turned off for adult testing. just set

`o.encouragement=1;`

for children, i imagine you need to finish in 10 minutes, in which case you'll want to reduce the number of trials per threshold to 20.

`o.trials=20;`

do you think that your children can deal with the Sloan letters? Note that we provide a page with 9 big letters on it, which they can point at. At one point in our discussion, i think you recommended

a set of icons for testing of pre-literate children, but I was then focused on getting the test working, and no longer recall the details. I know of the illiterate test produced by the NY Lighthouse, with umbrella, sailboat, apple, etc. And Lea Hyvarinen(?) has a set. Do you know whether the icons are available as electronic images? If you think Sloan works, i'm inclined to stick to it, but I am more than willing to try non-letter icons if I can get them.

i still aim to publish a brief article about the method with pilot data by end of december in F1000Research. it would be great to include your early results.

i will be in Cambridge for a day, December 22, to finalize my *Nature* paper with Horace, working at his house. I might be able to say hello at end of day before returning to London.

best

denis



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On Thu, Dec 10, 2015 at 4:15 AM, Waugh, Sarah <[Sarah.Waugh@anglia.ac.uk](mailto:Sarah.Waugh@anglia.ac.uk)> wrote:

Hi Denis,

Thanks! I managed to download on mac and use program over weekend – very nice – love the encouraging words!

Will try to download new one today/tomorrow – next week is last week of teaching, so busy finishing up courses/student clinics with revision sessions and a little hectic.

More later...

Very best,

Sarah

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Sarah J Waugh MScOptom PhD FAAO FHEA MCOptom  
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**From:** Denis Pelli [mailto:[denis.pelli@nyu.edu](mailto:denis.pelli@nyu.edu)]

**Sent:** 09 December 2015 16:53

**To:** Waugh, Sarah

**Subject:** Re: critical spacing program

dear sarah

we've polished the program. it now runs well on both Mac and Windows. Please use the new



version, attached. (also available on github.)  
can i help you get it going?

best

denis

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On Mon, Nov 30, 2015 at 5:33 AM, Waugh, Sarah <[Sarah.Waugh@anglia.ac.uk](mailto:Sarah.Waugh@anglia.ac.uk)>  
wrote:

Hi Denis,

Big thanks. Will give it a whirl when I get a chance! Looking forward to it.

Sorry to hear about your uncle. Safe trip away and back again for you.

Take greatest care

Sarah

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**From:** Denis Pelli [mailto:[denis.pelli@nyu.edu](mailto:denis.pelli@nyu.edu)]  
**Sent:** 30 November 2015 08:30  
**To:** Waugh, Sarah  
**Subject:** critical spacing program

dear sarah

the program is attached. it's quite polished and gives excellent results in informal testing of adults. i will test several normal adults over the next fews days.

it asks for the observer's name and has a page of instructions. the rest is just eye charts. adults find it easy and intuitive. i welcome your insights in making it so for children. it is currently using 9 letters of the Sloan font.

Please print the "Response page.pdf", and give a copy of it to each observer. Adults will find it helpful in choosing an answer when they are forced to guess. Children might find it easier to respond by pointing to what they think is a target letter. If there are two, they can point to one and then the other.

I imagine that it will be easy to find an icon font, but I haven't looked yet.

Do you have a computer to try this on? A

Macintosh laptop is ideal. The software automatically reads the screen size. A wireless keyboard or long keyboard cable is highly desirable as the viewing distance will be 3 m or more.

Try running runCriticalSpacing. It will measure four thresholds. You can always terminate the current run by hitting Escape. CriticalSpacing will then print out results so far and begin the next run.

Best

Denis

p.s.

My argentine uncle died on friday so i'm going down to Buenos Aires for the burial. I'll be back in NYC December 5.

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**3 attachments****Sheridan\_BMJ\_1960.pdf**

946K

**Sheridan-Gardiner \_BMJ\_1970.pdf**

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**Lippmann\_JPH\_1971.pdf**

1963K