Supplementary Material

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1 Introduction

This document provides the reader with additional, supplementary material towards our paper. It is designed to give the reader a more thorough understanding about our experiment, easing the task of relating to or recreating it. It further provides collected data and produced figures, which did not make it into the final version of our work.

2 Creating Text Snippets

An integral part of the conducted experiment is the proper creation of typographically adapted utterances. Supporting further research, we provide the CSS specifications that have been modified in a more detailed way. Further, as discussed in our paper, a variety of factors can influence the appearance of text. This is especially critical if perceptual studies are conducted on the text. Accordingly, this document provides supplementary information, such that conducted experiments can be properly reconstructed.

2.1 Technical Specifications

To create the text snippets, we developed a webpage, using Angular CLI version 12.0.5 and Node version 14.17.1. Rendering-critical components, that were used, include:

- Operating System: win32 x64

- Web browser: Google Chrome - Version 98.0.4758.102 (Official Build) (64-Bit)

2.2 Font Type

Many existing font types, do not support a granular increase in the typographic attributes to the needed extent. The font type Raleway, designed by Matt McInerney, Pablo Impallari, and Rodrigo Fuenzalida does however provide such fine steps. We integrated it into our webpage via:

```
@import url('https://fonts.googleapis.com/css2?family=Raleway:wght@100..900&display=swap');
```

2.3 CSS-Modifications

In the following, we will discuss the CSS modification necessary to produce the already mentioned text-snippets. The command `font-family: "Raleway"` has been used to set the correct font type globally. Font size changes have been implemented by using `font-size`, varying between 12, 20 and 28 px.

Font Weight – Modifying font weight is, due to being well encoded in the variable type font, very easy. The different perceptual granularity levels have thus been created by using:

```
font-weight: 420;
```

Oblique Angle – Despite Raleways' granular design towards font-weight, the font type does only support a binary selection towards oblique angle: non-italic or italic. Further, the italic-font design modifies the letterforms. Consequently, the font's italic designs can not be used for your study. We circumvented its usage by using CSS modifications that do not interfere with the letterform and simply sheer the letters according to a certain level:

```
:host ::ng-deep .oa75{
    display: inline-block;
    -moz-transform: scale(1) rotate(0deg) translate(0px, 0px) skew(-15deg, 0deg);
    -webkit-transform: scale(1) rotate(0deg) translate(0px, 0px) skew(-15deg, 0deg);
    -o-transform: scale(1) rotate(0deg) translate(0px, 0px) skew(-15deg, 0deg);
    -ms-transform: scale(1) rotate(0deg) translate(0px, 0px) skew(-15deg, 0deg);
    transform: scale(1) rotate(0deg) translate(0px, 0px) skew(-15deg, 0deg);
}
```

Spacing – On the other hand, applying the typographic attribute of spacing to the font, was a simple task:

```
:host ::ng-deep .spacestudy61{
    letter-spacing: 0mm;
}
```

Multivariate Encoding – To facilitate multiple attributes to be visualized in a single utterance, the CSS modifications above were simply used in combination.

2.4   Data Used to Create the Text Snippets

According granularity classes were then applied to text snippets taken from the vice presidential candidates debate between Joe Biden and Sarah Palin. The following utterances made up the content for the text blocks, whose creation has been described above.

```
Good evening from Washington University in St Louis , Missouri . I 'm Gwen Ifill of
The NewsHour and Washington Week on PBS. Welcome to this vice presidential debate.

It will be divided roughly into five-minute segments. Each candidate will have 90
seconds to respond to a direct question and then an additional two minutes for rebuttal.

The audience here in the hall has promised to remain very polite, no cheers, applause,
except right at this minute now, we welcome Governor Palin and Senator Biden.

Welcome to you both. As we have determined by a coin toss, the first question will
go to Senator Biden, with a 90-second follow-up from Governor Palin. Are you ready?

I think it's neither the best or worst of Washington, but it 's evidence of the fact
that the economic policies of the last eight years have been the worst economic policies.

If you need any more proof positive of how bad the economic theories have been, this
excessive deregulation, Wall Street run wild, I don't think you need more evidence.

Republicans have been put in a very difficult spot. But Barack Obama laid out four basic
criteria for any kind of rescue plan here. He stated there has to be oversight now!

We 're not going to write any check to anybody unless there 's oversight for the
of the secretary of Treasury. He secondly said you have to focus way more on homeowners.

Thank you for hosting this event, Gwen. And I thank the commission, also. I appreciate
this gifted privilege of being able to be here and speak with my fellow Americans.

Senator Biden how , as vice president , would you work to shrink this gap of
polarization which has sprung up in Washington , which you both have spoken about here?
```

Yes , you know until two weeks ago, it was exactly two Mondays ago. John McCain
said at 9 o'clock in the morning that the fundamentals of the economy were strong.

John McCain, in referring to the fundamental of economy being strong, he was
talking about the American workforce, which is, as we know, the greatest in this world.

Now, let 's talk about the next question is to talk about the subprime lending meltdown.
Which politician do you think was at fault? I start with you, Governor Palin.

There was deception there. Again, John McCain and I , that commitment that we have made,
and we 're going to follow through on that, getting rid of that corruption.

I think we need to band together and say never again . Never will we be exploited and
taken advantage of again by those who are managing and loaning us these dollars.

Well Gwen , two years ago Barack Obama warned about the sub prime mortgage crisis.
John McCain said shortly after in December he was surprised about the problem .

Governor , please if you want to respond to what he said about Senator McCain's
comments about health care ? I would be very interested in your viewpoint on this.

I would like to respond about the tax increases. We can speak in agreement here
hat darn right we need tax relief for Americans so that jobs can be created here.

The charge is absolutely not true. Barack Obama did not vote to raise taxes.
The vote she 's referring to, John McCain voted the exact same way in that procedural vote.

And I may not answer the questions the way that either the moderator or you want to hear,
but I 'm going to talk straight to the Americans and let them know records also.

OK, time is up here. We've got to move to the next question. Senator, we want to
talk about taxes. You proposed raising taxes on people who earn over 250,000 a year.

The middle class under John McCain's tax proposal, 100 million families, middle class
families/households, they got not a single change, not a single break in taxes.

2.5 Exporting Text Snippets

In order to proper use the annotated utterances, they had to be exported as HD pictures. Using the
libraries jsPDF and html2canvas, we facilitated the export of same-sized (length-wise, height could
differ based on utterance content), high definition pictures of text.

The libraries can be exported using `npm i html2canvas jspdf`. Importing them into the project
via:

```
import {jsPDF} from 'jspdf';
import html2canvas from 'html2canvas';
```

We used a simple for-loop to step through all utterances, exporting them via:

```
html2canvas(document.getElementById('utteranceDIV' + x), {scale : 6}).then(function(canvas) {
    var link = document.createElement("a");
    document.body.appendChild(link);
    link.download = 'html_image_' + i + '.png';
    link.href = canvas.toDataURL("image/png");
    link.target = '_blank';
    link.click();
});
```

2.6 Typographically Annotated Text Snippets

The different perceptual granularity distances listed in the paper and used in the distinct experiment cases are visualized in Figure 1. The text is arbitrarily chosen, however different characteristic of the typographic attributes can be easily compared.

(a) Visualization of Perceptual Granularity Distances Investigated For FW.

(b) Visualization of Perceptual Granularity Distances Investigated For OA.

(c) Visualization of Perceptual Granularity Distances Investigated For SP.
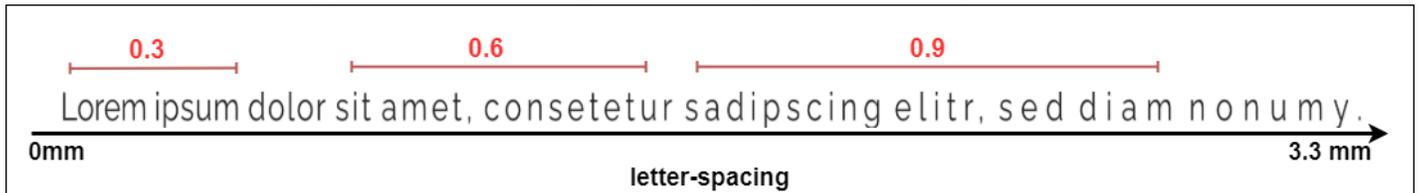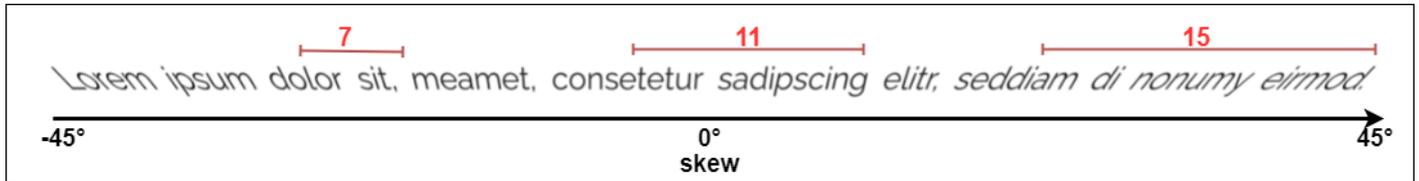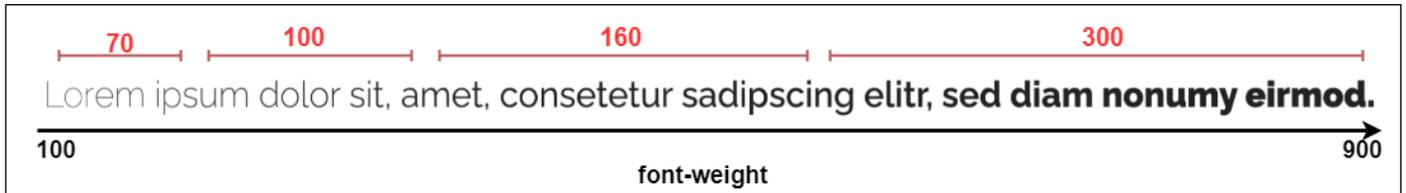
Figure 1: Visualization of the Different Perceptual Granularity Distances Investigated. Red Markings Depict the Distance Between Individual Classes of Text-snippets, which the Participants were Asked to Classify.

2.7 Comparison to More Commonly used Sans-Serif Fonts

Figure 2: A Side-by-side Comparison of the Sans-Serif Fonts Arial, Verdana and Raleway.

3   Additional Material

In this section we cover material, apart from the text snippets, which supported us in conducting the experiment. Additionally, we provide insights into the real design of our experiment.

3.1   Tasks

In the following, the tasks given to the participant, are presented. This concrete example focuses on the tasks for the two multivariate encoding templates for the typographic attributes Spacing and Font Weight.

In the following, the text snippets will be annotated with two typographic attributes at the same time:

Font Weight and S P A C I N G = **R E S U L T**

1) Please, sort the text snippets according to their font weight only. Therefore, move the snippets from the green field into the corresponding yellow field.
2) Afterwards, please fill out the questionnaire for task 3.

Figure 3: First Task for the Multivariate Encoding of Spacing and Font Weight

In the following, the text snippets will be annotated with two typographic attributes at the same time:

Font Weight and S P A C I N G = **R E S U L T**

1) Please, sort the text snippets according to their spacing only. Therefore, move the snippets from the green field into the corresponding yellow field.
2) Afterwards, please fill out the questionnaire for task 4.

Figure 4: Second Task for the Multivariate Encoding of Spacing and Font Weight
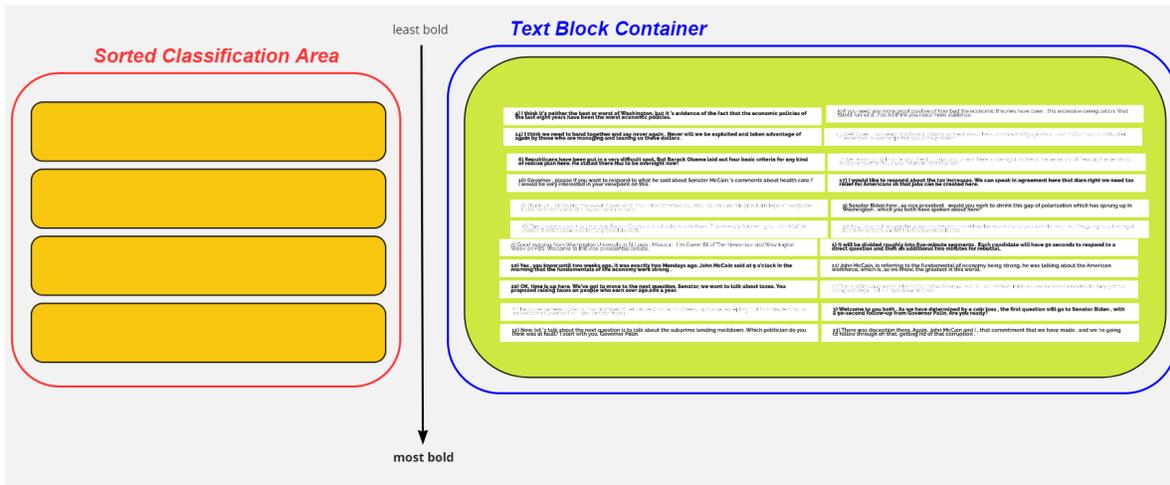
3.2 MIRO

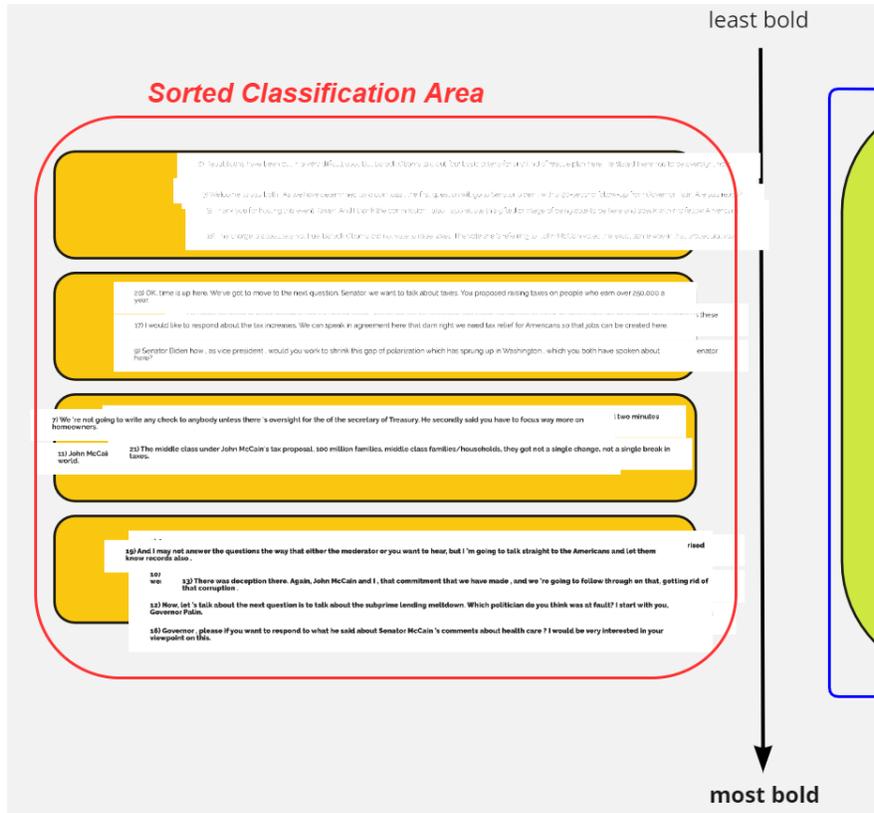Figure 5: Examplatory Template. Status Pre-Modification.

Figure 6: Examplatory Template. Status Post-Modification.

3.3 Questionnaires

After each completed subtask, that is after sorting all text snippets of a certain type and size, the participant was asked to fill out a modified NASA TLX (see Figure 7) in order to capture the perceived workload.

Questionnaire

Task 1

Q1) Mental Demand: How mentally demanding was the task?

Very Low | Q1 | Very High

Q2) Temporal Demand: How hurried or rushed was the pace of the task?

Very Low | Q2 | Very High

Q3) Performance: How successful were you in accomplishing what you were asked to do?

Perfect | Q3 | Failure

Q4) Effort: How hard did you have to work to accomplish your level of performance?

Very Low | Q4 | Very High

Q5) Frustration: How insecure, discouraged, irritated, stressed, and annoyed were you?

Very Low | Q5 | Very High

Figure 7: Modified NASA TLX Questionnaire

We chose to modify the questionnaire, since the sixth question about physical demand, "How much physical activity was required? Was the task easy or demanding, slack or strenuous?", was not of interest for us and would have burdened our participants unnecessarily.

4 Average Experiment Results

4.1 Raw Data

Font Weight:

Study	Time	TLX Mean	TLX STD	Err-Mean	Err-STD
Size 12					
FW_PGD300	01:43	12,513	10,778	0.125	0.342
FW_PGD160	02:41	18,3	4,96	1,56211	0.548
FW_PGD100	04:27	26	5.716	2.362	1.072
FW_PGD70	06:01	35.571	11.62	6.6875	2.22
Size 20					
FW_PGD300	01:07	9.778	6.124	0	0
FW_PGD160	02:15	14.53	7.101	0.0625	0.218
FW_PGD100	04:12	23.545	6.378	0.1875	0.489
FW_PGD70	05:43	31.818	3.816	5,21053	0.941
Size 28					
FW_PGD300	00:51	8.714	2.928	0	0
FW_PGD160	01:55	10.357	2.898	0	0
FW_PGD100	03:47	19,5	6.364	0.0625	0.218
FW_PGD70	05:32	26.857	9.008	3,0625	1.385

Oblique Angle:

Study	Time	TLX Mean	TLX STD	Err-Mean	Err-STD
Size 12					
OA_PGD15	05:15	16.167	2.483	0.94	0.827
OA_PGD12	06:41	25.889	5.862	1.9	1.005
OA_PGD9	07:25	33.667	5.982	5.772	2.349
Size 20					
OA_PGD15	02:47	11.333	3.786	0.125	0.212
OA_PGD12	04:31	18.6	2.881	0.667	0.856
OA_PGD9	05:56	25.083	9.010	3.391	1.751
Size 28					
OA_PGD15	02:52	10.071	5.269	0.191	0.535
OA_PGD12	04:17	15.5	5.080	0.782	0.716
OA_PGD9	05:12	22.667	3.215	2.739	2.179

Spacing:

Study	Time	TLX Mean	TLX STD	Err-Mean	Err-STD
Size 12					
SP_PGD.9	02:05	23.385	5.546	0.649	0.676
SP_PGD.6	02:53	27.929	7.033	4	2.777
SP_PGD.3	03:58	31.615	7.687	9.4	2.923
Size 20					
SP_PGD.9	02:13	26.615	10.079	0.565	0.589
SP_PGD.6	02:34	30.6	8.488	5.786	3.766
SP_PGD.3	03:38	33.544	9.799	10.714	5.355
Size 28					
SP_PGD.9	01:56	27.231	12.484	1.167	0.786
SP_PGD.6	02:40	32	11.796	6.308	4.956
SP_PGD.3	03:47	33.571	9.791	11.775	4.288

Multivariate Encoding:

| Study	Time	TLX Mean	TLX STD	Err-Mean	Err-STD
Font Weight + Oblique Angle					
FW	01:35	11.333	3.701	0	0
OA	03:11	20.385	7.611	0.722	0.826
Font Weight + Spacing					
FW	01:54	17.583	4.602	0	0
SP	02:36	32.977	11.579	2.286	1.977
Oblique Angle + Spacing					
OA	03:04	23.333	8.021	4.6	3.136
SP	02:50	32.429	10.518	3.7	2.129

4.2 Additional Visualizations
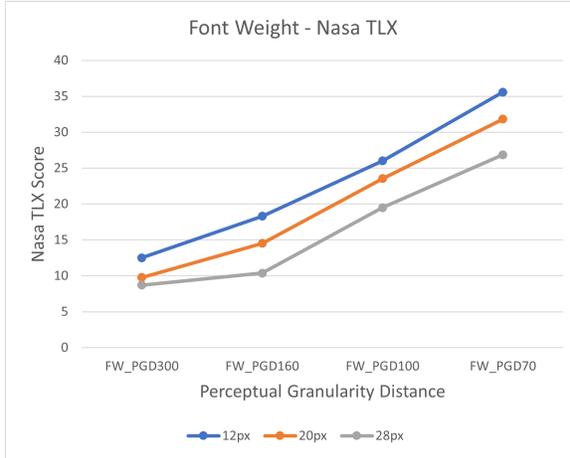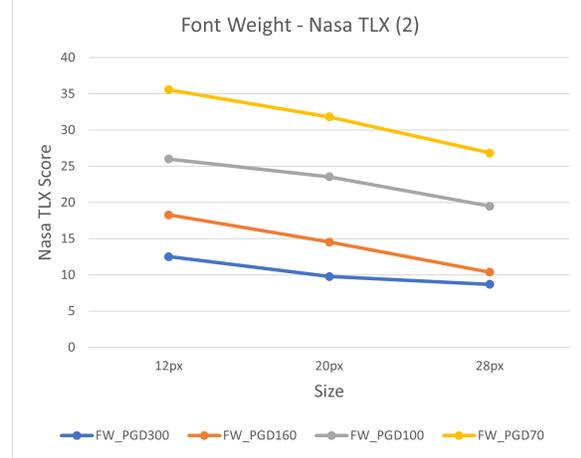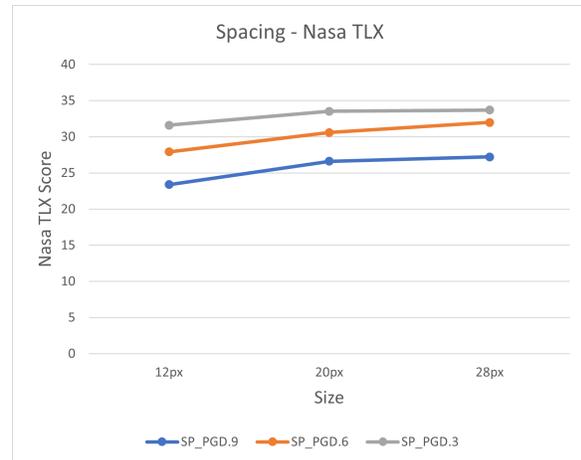

(a) Font Weight - Average NASA TLX Scores   (b) Font Weight - Average NASA TLX Scores (2)

Figure 8: The findings described in our paper are confirmed in the observed NASA TLX scores. Findings include the positive influence of increasing font size, as well as effective perceptual granularity distances.
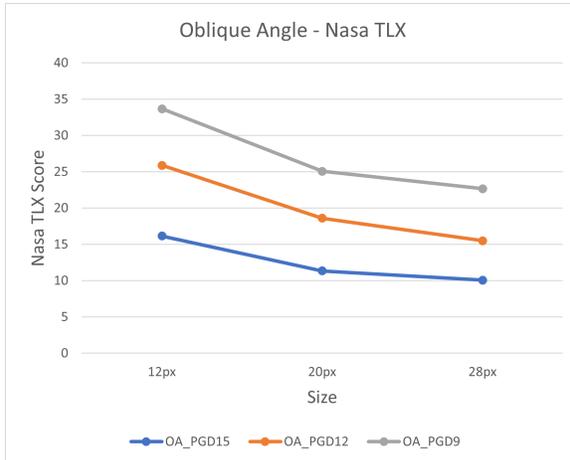
(a) Oblique Angle - Average NASA TLX Scores   (b) Spacing - Average NASA TLX Scores

Figure 9: Confirmed findings: Increasing font size does support the effectiveness of oblique angle to a certain degree. Increasing font size obstructs the effectiveness of absolute spacing.