Additional explanations

• In the following, we show the entire study as screenshots
• The order of the screenshots is the same as the order in the online study
• For all participants, the order of the questions resp. information and the used datasets were the same throughout the entire study
• Only the screenshots changed to vary the visualization designs within the between-subject study
  • We show all used visualization designs on the next slide
Used designs

- Linear bar chart
- Logarithmic bar chart
- Scale-stack bar chart
- Order of magnitude markers
- Width-scale bar chart
Thank you for your interest in participating in this study!

The aim of the study is to test a newly developed design for bar charts that shows data of large value range (e.g. from 1 to 10000).

During the study, we will show you several charts with questions to answer. This requires sufficient screen space of 13" or more.

It is therefore strongly recommended that you conduct this study on a computer screen (no smartphone, no tablet, no smart watch or other handheld device with screen size less than 13").

Please remove any external influences on your study participation (e.g. radio, television, phone ring, conversations, etc.).

Participation in the study is voluntary and you can stop at any time at your own request. In this case, your data will be deleted and not included in the evaluation.

The data collected during the study is stored, evaluated and reported in a privacy-preservation manner. We guarantee that your collected data will only be used for evaluations by the study team, and will not be passed on to third parties.

Declaration of consent

Please give your consent to study participation and data collection and processing via the buttons below.

The option “Yes, I agree” confirms your voluntary study participation. You give consent to anonymous storage of the data collected during the study. You understand that you can terminate the study at any time without consequences or without giving reasons.

By selecting the option “No, I do not agree and would like to cancel the study”, you do not agree with the modalities of data storage, and neither do you agree that you voluntarily participate in the study and you are aware that you may terminate the study at any time without giving any reason. Therefore, clicking on these options will immediately terminate your participation in this study.

☐ Yes, I agree
☐ No, I do not agree and would like to cancel the study

Next
Thank you for your support!

The study will show bar charts with questions to be answered using the chart. There are four types of questions:

1. Name the value of a bar (always an integer between 1 and 10,000)
2. Sort the bars according to their value in ascending order
3. Determine the ratio of two values (a number, always divide the larger value by the smaller value)
4. Name the trend shown in the data (linear, logarithmic, exponential or none)

Each question will be asked six times using different data. Altogether you will have to give 24 answers. Please answer all the questions. It is important that you answer carefully but as quickly as you can.

First you will see an example to get familiar with the bar chart design and the structure of the study.

Click on the "Next" button at the bottom right to start the study.
general information about your person

Please specify your sex.
- Male
- Female
- Prefer not to say

How old are you?
- < 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60+
- Prefer not to say

Do you have a defective vision (ametropia) that you compensate for by wearing a visual aid (glasses, contact lenses, etc.)?
- Yes
- No

How many different brightness levels do you see in the picture below?

[Color scale from light to dark]

Back  Next

5% completed
How to read width scale bar chart design

The value is split into two parts: the order of magnitude and its representation in this order of magnitude, aka mantissa.

- The height of the thin red bar indicates the MANTISSA on a scale of 0 to 10
- The MAGNITUDE is shown in both the width of a bar and the hue of the reddish colour: the darker the colour, the higher the order of magnitude

The legend shows the correspondence of colors and width with MAGNITUDE multiplier.

To determine the value of the bar A, you need to execute the following steps:
1. Look up the magnitude multiplier on the legend: 100
2. Read the value of the mantissa: 1
3. Multiply the value by the multiplier: $1 \times 100$

Bar A represents the value 100.
Example

You will see four examples, one for each task. Accordingly, the following four pages are intended for exercise purposes.
Take as long time as you want to and answer honestly.
For your verification, the correct answer is located below the intended input option.

The study will then start on a separate page.
Example

Read the value of a bar

Please enter the value of a given bar mentioned below into the text box.

The value is always an integer between 1 and 1000.

The answer should be 400.
Example

Sort the values
Please sort the represented values in an ascending order.
Start with the smallest value. To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.) To change your answer, you can reorder the grey boxes or move them back to the white area (via drag and drop).

The answer should be: C, G, D, H, B, E, A, F.
Example

Estimate the ratio

Please enter the ratio of two given bars into the text box. Always divide the larger value by the smaller value. The ratio is a number.

A & E

The answer should be 2

Back Next
Example

Trend analysis
Please identify the trend type in the chart:
- exponential
- linear
- logarithmic
- none

The answer should be "exponential".
Start

Now you are prepared to start the study.

*Remember to read the value(s) as quickly as possible.*

Click on the "Next" button at the bottom right to start the study.
1. Please read the value of bar E.
Enter the value into the text box.

E
2. Please read the value of bar G.
Enter the value into the text box.
3. Please read the value of bar B.
Enter the value into the text box.
B
4. Please read the value of bar A.

Enter the value into the text box:

A
5. Please read the value of bar D.
Enter the value into the text box:
6. Please read the value of bar H.
Enter the value into the text box.

H
Break ☕

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.

Please determine the ratio of 10 and 5.
Write down your answer into the textbox.

If you are ready to continue the study, please click on the "Next" button.

Remember to read the value(s) carefully but as quickly as you can.
7. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop.
8. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

A  B  C  D  E  F  G  H
1  2  3  4  5  6  7  8
9. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)

A  B  C  D  E  F  G  H
1  2  3  4  5  6  7  8

Back  Next
10. Please sort the represented values in an ascending order.
Start with the smallest value.
To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)
11. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double click as well.)
12. Please sort the represented values in an ascending order.

Start with the smallest value.

To solve this task, you have to move the grey boxes (labeled from A to H) onto the corresponding slots (labeled from 1 to 8) via drag and drop. (You can use a double as well.)
Break

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.

Please assign a trend to the shown charts.
Use drag and drop to place the boxes on the slots.

A  |  B  |  C  |  D
---|-----|-----|-----
exp| lin| log| none

If you are ready to continue the study, please click on the "Next" button.

Remember to read the value(s) carefully but as quickly as you can.
13. Please enter the ratio of two given bars into the text box.

Divide the larger value by the smaller value. The ratio is a number.

A & B
14. Please enter the ratio of two given bars into the text box.
Divide the larger value by the smaller value. The ratio is a number.

A : E
15. Please enter the ratio of two given bars into the text box.
Divide the larger value by the smaller value. The ratio is a number.

A & H
16. Please enter the ratio of two given bars into the text box. Divide the larger value by the smaller value. The ratio is a number.

A & B
17. Please enter the ratio of two given bars into the text box.

Divide the larger value by the smaller value. The ratio is a number.

A & E
18. Please enter the ratio of two given bars into the text box.
Divide the larger value by the smaller value. The ratio is a number.

A & H
Break ☕️

This is a short break. Calm down and answer one question, please.
Take as long time as you want to and answer honestly.

Please select the bar chart.

If you are ready to continue the study, please click on the “Next” button.

Remember to read the value(s) carefully but as quickly as you can.
19. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none
20. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none
21. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

[Diagram with bars representing different trend types]
22. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none
23. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none

Back   Next
24. Please identify the trend type in the chart.

- exponential
- linear
- logarithmic
- none
additional questions

Could you imagine using this design?
If so, please consider a context?
- yes
- no

Back  Next
additional questions

Personal opinion
If you have any comments or information that you have not yet been able to write down, you can do so here. This could be, for example, the following:
• Difficulties in answering individual questions
• Something you found particularly appealing
• ...
Thank you for participating in this study!