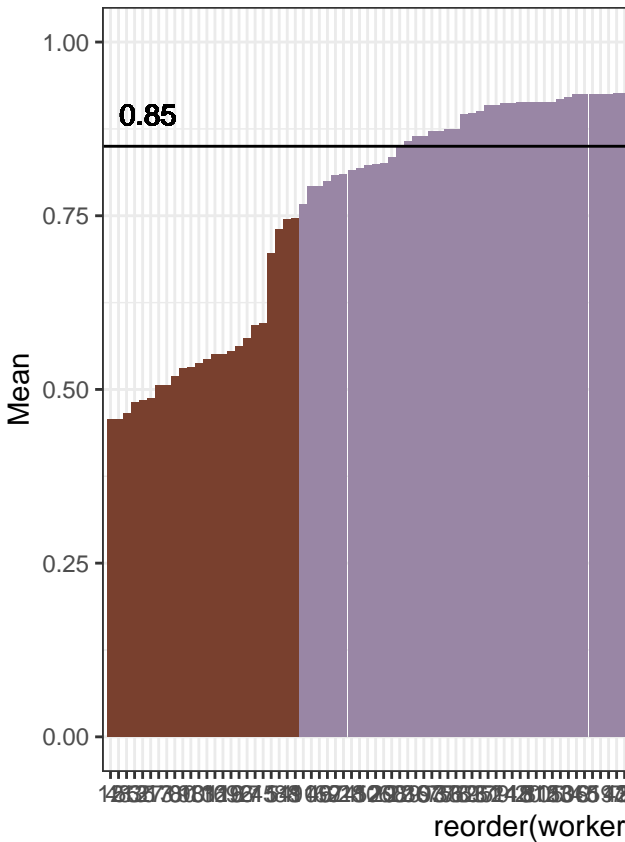# Perceptual Difficulty - Randomized and Timed Perceptibility2
(difficulty analysis)

Stimuli check

```
##
##       color material
##   no     81       81
##   yes    81       81
```

Exclusions Participants whose native language is not English are excluded

```
##   workerid language
## 1       57  Chinese
## 2       82
## 3       90  Spanish
```


Participants with accuracy lower than 75% are excluded (29 participants)

```
## # A tibble: 24 x 7
##    workerid  Mean   CILow CIHigh  YMin  YMax lowacc
##       <int> <dbl>   <dbl>  <dbl> <dbl> <dbl> <chr>
## 1        0 0.519 0.0988  0.111  0.420 0.630 1
## 2        1 0.746 0.119   0.104  0.627 0.851 1
```

```
##  3        3 0.506 0.101  0.101  0.405 0.608 1
##  4        6 0.573 0.12   0.107  0.453 0.68  1
##  5        7 0.593 0.0988 0.0988 0.494 0.691 1
##  6       12 0.457 0.0988 0.111  0.358 0.568 1
##  7       13 0.481 0.101  0.114  0.380 0.595 1
##  8       16 0.556 0.111  0.112  0.444 0.667 1
##  9       17 0.506 0.111  0.111  0.395 0.617 1
## 10       27 0.488 0.112  0.112  0.375 0.6   1
## # ... with 14 more rows
```

By response times

Regardless of response correctness and feature matching

```
## # A tibble: 15 x 7
##    label                        condition    Mean CILow CIHigh count group
##    <fct>                        <chr>       <dbl> <dbl>  <dbl> <int> <chr>
##  1 table_metal_blue             material yes 1266.  136.   152.    22 rt
##  2 table_metal_green            material yes 1253.  174.   166.    20 rt
##  3 chair_metal_purple           material yes 1244.  117.   125.    25 rt
##  4 box_wood_blue                material yes 1212.  143.   145.    23 rt
##  5 plate_plastic_pink           material yes 1211.  124.   127.    20 rt
##  6 table_metal_silver_original  material yes 1204.  119.   121.    20 rt
##  7 table_wood_green             material yes 1201.  106.   112.    26 rt
##  8 chair_metal_green            material yes 1187.  131.   139.    20 rt
##  9 jacket_leather_green         material yes 1187.  122.   142.    24 rt
## 10 bottle_glass_blue            material yes 1185.  123.   126.    23 rt
## 11 pitcher_metal_blue           material yes 1185.  160.   167.    22 rt
## 12 spoon_wood_green             material yes 1179.  127.   138.    24 rt
## 13 plate_paper_blue             material no  1177.  115.   131.    25 rt
## 14 boot_leather_green           material yes 1174.  122.   149.    19 rt
## 15 pitcher_plastic_white_original material yes 1174.  123.   108.    20 rt

## # A tibble: 15 x 7
##    label                        condition    Mean CILow CIHigh count group
##    <fct>                        <chr>       <dbl> <dbl>  <dbl> <int> <chr>
##  1 plate_paper_blue             color yes     943. 102.   111.    25 rt
##  2 table_metal_blue             color yes     941.  91.0  107.    26 rt
##  3 box_cardboard_brown_original color yes     941.  93.8   95.7   26 rt
##  4 table_wood_green             color no      940.  89.2  107.    20 rt
##  5 table_metal_green            color yes     938.  75.9   86.8   20 rt
##  6 cup_plastic_green            color no      932.  76.0   80.9   25 rt
##  7 chair_plastic_blue_original  color yes     930.  83.4   88.0   20 rt
##  8 table_wood_brown_original    material yes  928. 101.   109.    25 rt
##  9 spoon_metal_green            color yes     924.  97.5  106.    25 rt
## 10 jacket_denim_purple          color yes     922.  83.9   85.3   20 rt
## 11 pitcher_metal_blue           color yes     922   91.2  105.    20 rt
## 12 cup_plastic_blue             material yes  918.  80.3   84.4   26 rt
## 13 table_wood_brown_original    color yes     917.  79.9   87.1   24 rt
## 14 cup_plastic_green            color yes     911. 102.   156.    20 rt
## 15 plate_plastic_blue_original  color yes     875.  92.3   94.9   24 rt
```

Only correct responses, regardless of feature matching

```
## # A tibble: 15 x 7
##    label                   condition     Mean CILow CIHigh count group
##    <fct>                   <chr>        <dbl> <dbl>  <dbl> <int> <chr>
##  1 table_metal_green       material yes 1316.  216.   212.    12 correct_rt
##  2 table_metal_blue        material yes 1305.  200.   197.    14 correct_rt
##  3 chair_metal_purple      material yes 1282.  141.   128.    19 correct_rt
##  4 table_wood_green        material yes 1206.  121.   122.    23 correct_rt
##  5 bottle_glass_clear_original color no  1190.  130.   146.    22 correct_rt
##  6 table_metal_silver_original material yes 1185.  168.   154.    15 correct_rt
##  7 jacket_leather_purple   material yes 1185.  183.   187.    17 correct_rt
##  8 chair_metal_green       material yes 1181.  140.   148.    19 correct_rt
##  9 boot_leather_green      material yes 1174.  126.   134.    19 correct_rt
## 10 chair_metal_silver_original material yes 1165.  146.   152.    24 correct_rt
## 11 boot_leather_black_original material no  1164.  119.   127.    24 correct_rt
## 12 spoon_metal_green       material yes 1161.  181.   179.    18 correct_rt
## 13 spoon_wood_blue         color no     1160.  165.   169.    21 correct_rt
## 14 chair_wood_purple       material yes 1157.  167.   160.    21 correct_rt
## 15 table_wood_blue         material yes 1156.  141.   149.    25 correct_rt

## # A tibble: 15 x 7
##    label                   condition     Mean CILow CIHigh count group
##    <fct>                   <chr>        <dbl> <dbl>  <dbl> <int> <chr>
##  1 box_wood_brown_original     material yes 936   92.8  117.     23 correct_rt
##  2 bottle_plastic_green    color yes    935.  104.   105.    18 correct_rt
##  3 bowl_metal_silver_original  material yes 934.  112.   123.     22 correct_rt
##  4 cup_plastic_green       color no     932.   74.5   75.8   25 correct_rt
##  5 table_wood_brown_original   material yes 928.   96.9   97.0   25 correct_rt
##  6 jacket_denim_purple     color yes    922.   87.9   83.4   20 correct_rt
##  7 table_metal_blue        color yes    922.   94.1  102.    25 correct_rt
##  8 cup_plastic_blue        material yes 918.   77.5   87.6   26 correct_rt
##  9 cup_plastic_clear_original  color yes    917.  100.   117.    21 correct_rt
## 10 pitcher_metal_blue      color yes    915.   92.0  113.    19 correct_rt
## 11 cup_plastic_green       color yes    911.  118.   139.    20 correct_rt
## 12 bottle_glass_green      color yes    903.   79.5   86.9   19 correct_rt
## 13 chair_plastic_blue_original color yes    890.   77.2   73.7   18 correct_rt
## 14 table_wood_brown_original   color yes    876.   63.1   71.9   22 correct_rt
## 15 plate_plastic_blue_original color yes    875.   93.6  109.     24 correct_rt
```

Only correct responses, only matching features

```
## # A tibble: 15 x 7
##    label                   condition     Mean CILow CIHigh count group
##    <fct>                   <chr>        <dbl> <dbl>  <dbl> <int> <chr>
##  1 table_metal_green       material y~ 1316.  204.   214.    12 correct_matchin~
##  2 table_metal_blue        material y~ 1305.  211.   218.    14 correct_matchin~
##  3 chair_metal_purple      material y~ 1282.  147.   139.    19 correct_matchin~
##  4 table_wood_green        material y~ 1206.  114.   134.    23 correct_matchin~
##  5 table_metal_silver_ori~ material y~ 1185.  148.   158.    15 correct_matchin~
##  6 jacket_leather_purple   material y~ 1185.  187.   178.    17 correct_matchin~
##  7 chair_metal_green       material y~ 1181.  151.   148.    19 correct_matchin~
##  8 boot_leather_green      material y~ 1174.  121.   131.    19 correct_matchin~
##  9 chair_metal_silver_ori~ material y~ 1165.  154.   157.    24 correct_matchin~
## 10 spoon_metal_green       material y~ 1161.  167.   179.    18 correct_matchin~
## 11 chair_wood_purple       material y~ 1157.  157.   170.    21 correct_matchin~
## 12 table_wood_blue         material y~ 1156.  140.   160.    25 correct_matchin~
```

```
## 13 plate_paper_blue       material y~ 1149. 154.   146.      16 correct_matchin~
## 14 bottle_glass_blue       material y~ 1147. 130.   138.      21 correct_matchin~
## 15 jacket_denim_green      material y~ 1146.  91.6   87.4     17 correct_matchin~
```

```
## # A tibble: 15 x 7
##    label                  condition     Mean CILow CIHigh count group
##    <fct>                  <chr>        <dbl> <dbl>  <dbl> <int> <chr>
##  1 box_cardboard_brown_or~ material yes  936.  94.4  107.      23 correct_matchi~
##  2 box_wood_brown_original material yes  936   86.3  117.      23 correct_matchi~
##  3 bottle_plastic_green    color yes     935. 101.   114.      18 correct_matchi~
##  4 bowl_metal_silver_orig~ material yes  934. 100.   112.      22 correct_matchi~
##  5 table_wood_brown_origi~ material yes  928.  91.6  100.      25 correct_matchi~
##  6 jacket_denim_purple     color yes     922.  80.6   82.8     20 correct_matchi~
##  7 table_metal_blue        color yes     922.  94.3   96.7     25 correct_matchi~
##  8 cup_plastic_blue        material yes  918.  77.9   87.2     26 correct_matchi~
##  9 cup_plastic_clear_orig~ color yes     917. 102.   117.      21 correct_matchi~
## 10 pitcher_metal_blue      color yes     915.  92.0  113.      19 correct_matchi~
## 11 cup_plastic_green       color yes     911. 118.   144.      20 correct_matchi~
## 12 bottle_glass_green      color yes     903.  79.3   80.9     19 correct_matchi~
## 13 chair_plastic_blue_ori~ color yes     890.  75.1   74.4     18 correct_matchi~
## 14 table_wood_brown_origi~ color yes     876.  63.6   69.0     22 correct_matchi~
## 15 plate_plastic_blue_ori~ color yes     875.  87.2  104.      24 correct_matchi~
```

Only correct responses, only not matching features

```
## # A tibble: 15 x 7
##    label                  condition    Mean CILow CIHigh count group
##    <fct>                  <chr>       <dbl> <dbl>  <dbl> <int> <chr>
##  1 bottle_glass_clear_or~ color no    1190. 134.   134.      22 correct_notmatch~
##  2 boot_leather_black_or~ material no 1164. 120.   131.      24 correct_notmatch~
##  3 spoon_wood_blue        color no    1160. 166.   179.      21 correct_notmatch~
##  4 plate_paper_blue       material no 1155. 132.   148.      23 correct_notmatch~
##  5 boot_leather_brown     color no    1150. 140.   138.      25 correct_notmatch~
##  6 bottle_glass_green     material no 1146. 138.   148.      22 correct_notmatch~
##  7 chair_metal_green      color no    1146. 143.   165.      25 correct_notmatch~
##  8 spoon_wood_green       material no 1144. 136.   149.      22 correct_notmatch~
##  9 table_wood_brown_orig~ color no    1140. 136.   155.      23 correct_notmatch~
## 10 bottle_glass_green     color no    1137. 126.   129.      24 correct_notmatch~
## 11 bag_paper_brown_origi~ material no 1135. 124.   122.      25 correct_notmatch~
## 12 cup_metal_green        color no    1131. 146.   152.      24 correct_notmatch~
## 13 boot_leather_green     material no 1126. 122.   133.      26 correct_notmatch~
## 14 jacket_denim_green     material no 1123. 135.   143.      27 correct_notmatch~
## 15 plate_paper_white_ori~ material no 1122. 115.   121.      26 correct_notmatch~
```

```
## # A tibble: 15 x 7
##    label                  condition    Mean CILow CIHigh count group
##    <fct>                  <chr>       <dbl> <dbl>  <dbl> <int> <chr>
##  1 pitcher_glass_blue     material no  979.  90.3   94.2     17 correct_notmatc~
##  2 pitcher_plastic_white_~ material no  978. 106.   128.      24 correct_notmatc~
##  3 chair_wood_brown_origi~ color no     977. 104.   126.      20 correct_notmatc~
##  4 chair_plastic_blue_ori~ color no     972. 107.   117.      24 correct_notmatc~
##  5 jacket_denim_purple     material no  968. 113.   140.      22 correct_notmatc~
##  6 cup_metal_silver_origi~ color no     966   92.2  113.      22 correct_notmatc~
##  7 jacket_denim_blue_orig~ color no     964   85.0  105.      19 correct_notmatc~
##  8 chair_metal_purple      color no     962. 101.   122.      18 correct_notmatc~
##  9 table_wood_green        material no  961. 121.   138.      20 correct_notmatc~
```

```
## 10 table_wood_brown_origi~ material no  961.  79.1  92.1      20 correct_notmatc~
## 11 jacket_leather_black_o~ color no     960.  90.1  104.      19 correct_notmatc~
## 12 bowl_glass_green        material no   954.  96.9  110.      20 correct_notmatc~
## 13 boot_rubber_brown       color no      942.  78.5  90.6      23 correct_notmatc~
## 14 table_wood_green        color no      937.  98.6  107.      19 correct_notmatc~
## 15 cup_plastic_green       color no      932.  76.1  75.9      25 correct_notmatc~
```

By error rates

Regardless of feature matching

```
## # A tibble: 15 x 7
##     label                   condition      Mean CILow CIHigh count group
##     <fct>                   <chr>         <dbl> <dbl>  <dbl> <int> <chr>
##  1 table_metal_green        material yes 0.6   0.201  0.2      20 er
##  2 table_metal_blue         material yes 0.636 0.227  0.182    22 er
##  3 plate_paper_blue         material yes 0.667 0.208  0.167    24 er
##  4 spoon_wood_green         material yes 0.667 0.208  0.208    24 er
##  5 box_cardboard_blue       material no  0.708 0.208  0.167    24 er
##  6 boot_rubber_brown        material yes 0.72  0.160  0.16     25 er
##  7 spoon_wood_blue          material yes 0.737 0.211  0.211    19 er
##  8 bowl_glass_blue          material yes 0.75  0.200  0.15     20 er
##  9 table_metal_silver_original material yes 0.75  0.200  0.15     20 er
## 10 chair_metal_purple       material yes 0.76  0.161  0.16     25 er
## 11 jacket_denim_purple      material yes 0.76  0.161  0.16     25 er
## 12 bag_plastic_blue         material no  0.789 0.211  0.158    19 er
## 13 plate_plastic_green      material yes 0.789 0.211  0.158    19 er
## 14 bag_plastic_green        material no  0.792 0.167  0.167    24 er
## 15 boot_rubber_green        color yes    0.792 0.167  0.167    24 er

## # A tibble: 15 x 7
##     label                   condition      Mean CILow CIHigh count group
##     <fct>                   <chr>         <dbl> <dbl>  <dbl> <int> <chr>
##  1 spoon_metal_silver_original material yes    1     0      0    24 er
##  2 spoon_plastic_green      color yes       1     0      0    25 er
##  3 spoon_plastic_white_original color no    1     0      0    24 er
##  4 spoon_wood_brown_original material no     1     0      0    24 er
##  5 spoon_wood_green         material no     1     0      0    22 er
##  6 table_metal_blue         material no     1     0      0    20 er
##  7 table_metal_green        material no     1     0      0    24 er
##  8 table_metal_silver_original material no   1     0      0    25 er
##  9 table_wood_blue          color no       1     0      0    23 er
## 10 table_wood_blue          color yes      1     0      0    27 er
## 11 table_wood_blue          material no     1     0      0    20 er
## 12 table_wood_blue          material yes    1     0      0    25 er
## 13 table_wood_brown_original material no    1     0      0    20 er
## 14 table_wood_brown_original material yes   1     0      0    25 er
## 15 table_wood_green         color yes       1     0      0    25 er
```

Only matching features

```
## # A tibble: 15 x 7
##     label                   condition      Mean CILow CIHigh count group
##     <fct>                   <chr>         <dbl> <dbl>  <dbl> <int> <chr>
```

```
##  1 table_metal_green          material yes 0.6   0.25   0.2        20 matching_er
##  2 table_metal_blue           material yes 0.636 0.227  0.182      22 matching_er
##  3 plate_paper_blue           material yes 0.667 0.208  0.167      24 matching_er
##  4 spoon_wood_green           material yes 0.667 0.167  0.167      24 matching_er
##  5 boot_rubber_brown          material yes 0.72  0.200  0.16       25 matching_er
##  6 spoon_wood_blue            material yes 0.737 0.211  0.158      19 matching_er
##  7 bowl_glass_blue            material yes 0.75  0.200  0.15       20 matching_er
##  8 table_metal_silver_original material yes 0.75  0.200  0.15      20 matching_er
##  9 chair_metal_purple         material yes 0.76  0.16   0.16       25 matching_er
## 10 jacket_denim_purple        material yes 0.76  0.16   0.16       25 matching_er
## 11 plate_plastic_green        material yes 0.789 0.211  0.158      19 matching_er
## 12 boot_rubber_green          color yes    0.792 0.167  0.167      24 matching_er
## 13 spoon_wood_blue            color yes    0.792 0.167  0.125      24 matching_er
## 14 bowl_metal_blue            material yes 0.8   0.16   0.160      25 matching_er
## 15 bowl_metal_green           color yes    0.8   0.16   0.160      25 matching_er

## # A tibble: 15 x 7
##    label                  condition   Mean CILow CIHigh count group
##    <fct>                  <chr>      <dbl> <dbl>  <dbl> <int> <chr>
##  1 pitcher_metal_green         color yes     1    0      0    25 matching_er
##  2 pitcher_metal_green         material yes  1    0      0    19 matching_er
##  3 pitcher_plastic_blue        material yes  1    0      0    26 matching_er
##  4 plate_paper_blue            color yes     1    0      0    25 matching_er
##  5 plate_paper_green           color yes     1    0      0    26 matching_er
##  6 plate_paper_white_original  color yes     1    0      0    25 matching_er
##  7 plate_plastic_blue_original color yes     1    0      0    24 matching_er
##  8 plate_plastic_green         color yes     1    0      0    25 matching_er
##  9 spoon_metal_silver_original color yes     1    0      0    20 matching_er
## 10 spoon_metal_silver_original material yes  1    0      0    24 matching_er
## 11 spoon_plastic_green         color yes     1    0      0    25 matching_er
## 12 table_wood_blue             color yes     1    0      0    27 matching_er
## 13 table_wood_blue             material yes  1    0      0    25 matching_er
## 14 table_wood_brown_original   material yes  1    0      0    25 matching_er
## 15 table_wood_green            color yes     1    0      0    25 matching_er
```

Only not matching features

```
## # A tibble: 15 x 7
##    label                  condition   Mean CILow CIHigh count group
##    <fct>                  <chr>      <dbl> <dbl>  <dbl> <int> <chr>
##  1 box_cardboard_blue        material no 0.708 0.167  0.167      24 notmatching_~
##  2 bag_plastic_blue          material no 0.789 0.211  0.158      19 notmatching_~
##  3 bag_plastic_green         material no 0.792 0.167  0.167      24 notmatching_~
##  4 pitcher_glass_green       color no    0.792 0.167  0.167      24 notmatching_~
##  5 box_cardboard_brown_origi~ material no 0.8   0.2    0.150     20 notmatching_~
##  6 chair_metal_green         material no 0.815 0.148  0.148      27 notmatching_~
##  7 bag_paper_blue            material no 0.833 0.167  0.125      24 notmatching_~
##  8 cup_plastic_clear_original color no   0.833 0.167  0.125      24 notmatching_~
##  9 boot_rubber_brown         material no 0.84  0.160  0.12       25 notmatching_~
## 10 bag_paper_green           color no    0.85  0.15   0.15       20 notmatching_~
## 11 pitcher_glass_clear_origi~ color no   0.85  0.200  0.15       20 notmatching_~
## 12 pitcher_plastic_blue      color no    0.85  0.151  0.15       20 notmatching_~
## 13 pitcher_metal_green       material no 0.852 0.148  0.111      27 notmatching_~
## 14 plate_plastic_pink        material no 0.852 0.148  0.111      27 notmatching_~
## 15 spoon_metal_green         material no 0.852 0.148  0.111      27 notmatching_~
```

```
## # A tibble: 15 x 7
##    label                   condition    Mean CILow CIHigh count group
##    <fct>                   <chr>       <dbl> <dbl>  <dbl> <int> <chr>
##  1 jacket_leather_purple   material no     1     0      0    23 notmatching~
##  2 pitcher_metal_blue      color no        1     0      0    24 notmatching~
##  3 pitcher_metal_silver_origi~ color no    1     0      0    24 notmatching~
##  4 pitcher_plastic_green   material no     1     0      0    22 notmatching~
##  5 plate_paper_green       color no        1     0      0    23 notmatching~
##  6 plate_plastic_blue_original material no 1     0      0    24 notmatching~
##  7 spoon_plastic_white_origin~ color no    1     0      0    24 notmatching~
##  8 spoon_wood_brown_original material no   1     0      0    24 notmatching~
##  9 spoon_wood_green        material no     1     0      0    22 notmatching~
## 10 table_metal_blue        material no     1     0      0    20 notmatching~
## 11 table_metal_green       material no     1     0      0    24 notmatching~
## 12 table_metal_silver_original material no 1     0      0    25 notmatching~
## 13 table_wood_blue         color no        1     0      0    23 notmatching~
## 14 table_wood_blue         material no     1     0      0    20 notmatching~
## 15 table_wood_brown_original material no   1     0      0    20 notmatching~
```

Is there overlap?

```
## # A tibble: 60 x 3
## # Groups:   label [48]
##    label                   condition     count
##    <fct>                   <chr>         <int>
##  1 chair_metal_purple      material yes      5
##  2 table_metal_blue        material yes      5
##  3 table_metal_green       material yes      5
##  4 table_metal_silver_original material yes  5
##  5 boot_leather_green      material yes      3
##  6 chair_metal_green       material yes      3
##  7 plate_paper_blue        material yes      3
##  8 spoon_wood_green        material yes      3
##  9 table_wood_green        material yes      3
## 10 bag_plastic_blue        material no       2
## # ... with 50 more rows

## # A tibble: 60 x 3
## # Groups:   label [42]
##    label                   condition     count
##    <fct>                   <chr>         <int>
##  1 table_wood_brown_original  material yes   5
##  2 plate_plastic_blue_original color yes     4
##  3 chair_plastic_blue_original color yes     3
##  4 cup_plastic_blue        material yes      3
##  5 cup_plastic_green       color no         3
##  6 cup_plastic_green       color yes        3
##  7 jacket_denim_purple     color yes        3
##  8 pitcher_metal_blue      color yes        3
##  9 table_metal_blue        color yes        3
## 10 table_wood_brown_original  color yes      3
## # ... with 50 more rows
```