

APPENDIX J

Effectiveness of U.S. and International Currency Features

APPENDIX J

Effectiveness of U.S. and International Currency Features

All comments provided in this appendix are based on the direct results, statements and observations of the participants from the usability study. Descriptions of features in this appendix do not represent opinion on the part of the ARINC Team or the BEP.

The currency depictions in this Appendix are provided to illustrate the features used by blind and VI participants to denominate the notes. The scales of the illustrations are not representative of actual currency dimensions.

Australian Dollar (AU)

Australian dollars vary in size by length only, with each higher denomination 7mm longer than the previous.

	AU \$5	\$10	\$20	\$50	\$100

AU\$5: Front



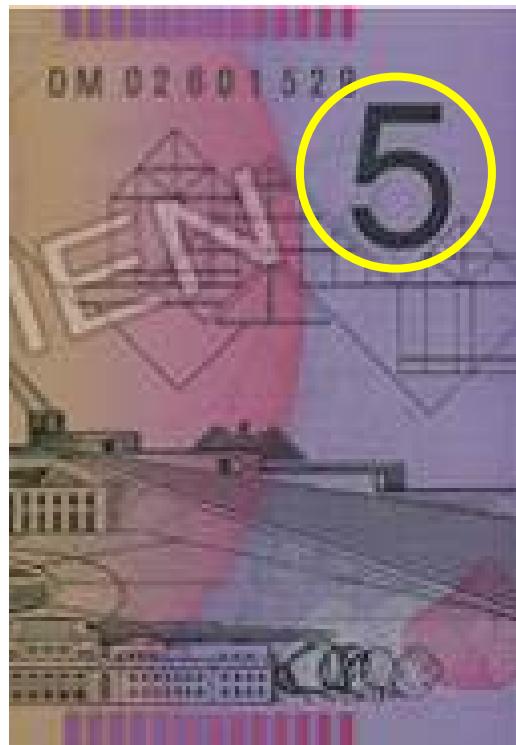
Numeral foreground/ background contrast: moderate

Numeral Size: just large enough; most visually impaired (VI) would prefer larger

Transparent window: detectable by touch by some blind participants but not discernable vs. AU\$10, AU\$20.

AU\$5: Back

Base color: Good color differentiation vs. other denominations, slightly too dark for some VI participants.



Numeral foreground/ background contrast: moderate

AU\$10: Front



Numeral foreground/background contrast: moderate

Numeral Size: good

Transparent window is detectable by touch by some blind participants but not discernable vs. AU\$5, AU\$20.

AU\$10: Back



Same numeral on both sides means VI participants don't need to front the bill to denominate it.

Upper corner location means slightly easier inventory from wallet.

Base color: a bit too dark for some participants

AU\$20: Front



Numeral foreground/background contrast is good for most VI participants but not ideal

Numeral Size: good

Transparent window is detectable by touch by some blind participants but not discernable vs. AU\$5, AU\$10. May be discernable vs. AU\$50.

AU\$20: Back



Base color: good color differentiation vs. other denominations, saturation/darkness

Substrate: acquires more texture as it circulates. Somewhat resistant to folding. Easily differentiable vs. traditional cloth substrate.

AU\$50: Front



Numeral foreground/background contrast:
good for most VI participants but background may be a little too dark.

Numeral Size: good

Note: Zero is different size for each denomination

Transparent window is detectable by touch by some blind participants but not discernable vs. AU\$100. May be discernable vs. AU\$20.

AU\$100: Front



**Numeral foreground/
background contrast:** good for
most VI participants but not ideal

Numeral Size: good

Transparent window is detectable by
touch by some blind participants but
not discernable vs. AU\$50.

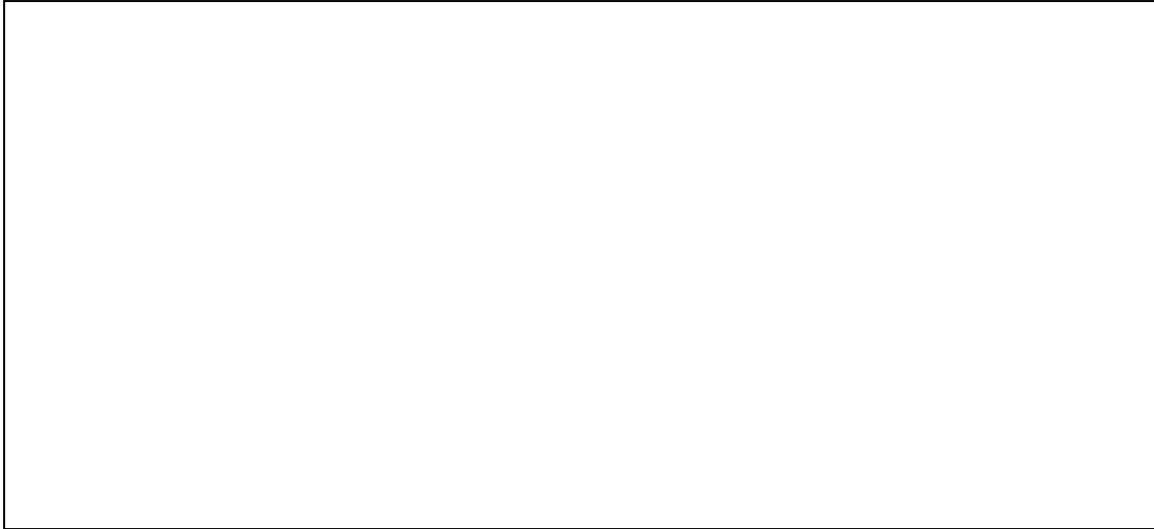
AU\$100: Back



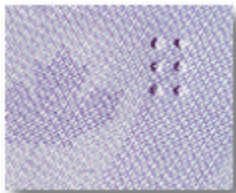
Base color: good color differentiation
vs. other denominations, saturation/
darkness is good.

Canadian Dollar (CA)

All Canadian dollars are the same size – 152.4 x 69.85 mm (6.0 x 2.75 inches).



The Canadian dollars include a tactile feature – clusters of raised dots that feel similar to Braille but are not as difficult to differentiate. The raised dots are in clusters, with each cluster always having all six dots raised. The dot size and spacing are the same as with standard Braille, but the dot height when new is lower (140 micrometers vs. 400 micrometers.)



CA\$5 front:

Printing the numeral over the top of the foil hologram strip greatly reduces the foreground/background contrast.



Foil hologram strip: detectable by some blind participants but less reliable when worn. More durable as a tactile affordance than raised dots. If detectable it may be used to orient the bill to find the tactile dots or raised numeral.

Tactile dots: wear down as the banknotes circulate.

Numeral foreground/background contrast: ideal – good for almost all VI participants

Numeral Size: very good

Raised Ink: detectable by some blind participants. Not used by VI participants. Wears down as the bills circulate. Less popular than the raised dots.

CA\$5 back:

Reversed numeral: good size and contrast, enables denomination from either side. Positioned in top corner for easy wallet inventory. Light on dark scheme not preferred by most VI participants.



Base color: good color differentiation vs. other denominations, saturation/darkness is good.

CA\$10:

Security strip: slightly reduces numeral readability.



CA\$20:



Silhouette: a consistent design theme offered no distinct differences between the denominations that could be used to quickly denominate from arm's length if color sensitivity was lost.



Raised dots: Generally not detectable from the reverse. Not all participants figured out how to turn over bills efficiently to search for the dots. Searching for the correct corner sometimes required many seconds, adding considerable frustration ("Am I even searching in the right area?") when the dots were worn.

CA\$50:



Numerals: as with the U.S. banknotes, the 20 and 50 were easy to confuse for some VI participants, particularly when the notes were upside-down. Many blind participants can detect shapes of numerals, but the 2 and 5 are still not easily discernable at this scale and thickness.

CA\$100:



Numerals: Zeros were easier to identify than other numerals. A few participants identified 100s by the fact that they had two zeros.

Swiss Franc (CHF)

As with Australian banknotes, Swiss francs vary in size by length only, by increments of 11 mm (126 mm, 137 mm, and 148 mm). The width of all the notes is 74 mm. There are fewer denominations in common circulation, so the difference in length between each denomination is larger.

	10	20	50
--	----	----	----

CHF10 front:

Numerals: low contrast, difficult or impossible to read for most VI participants.



Microperforations:
Not detectable for most participants.

Foil hologram patch:
Shape not discernable for most participants.

Raised-ink symbol: not detectable for most participants.

Smaller Numerals: easier to read for some VI participants due to good contrast, relatively uncluttered background.

CHF10 back:

Numerals: medium contrast, fairly easy to read for most VI participants but not ideal.

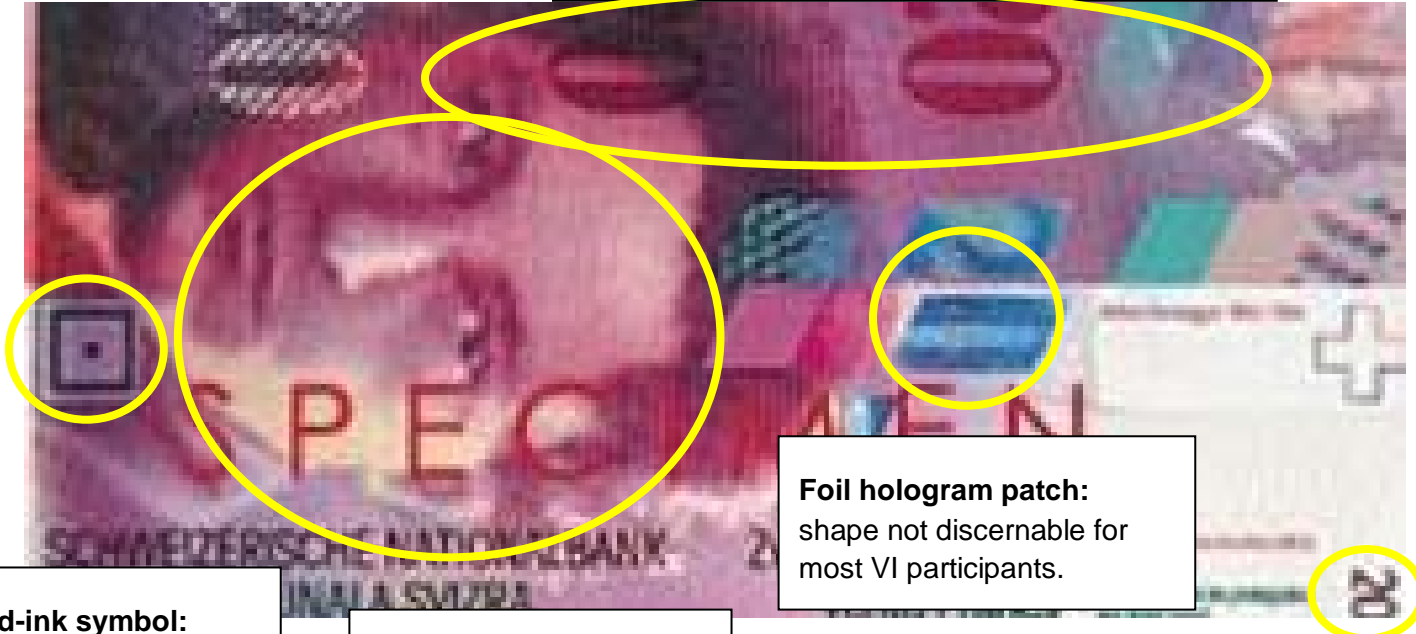


Base colors: discrimination was somewhat more difficult for the VI due to the multi-color mixture.

Smaller Numerals: not quite as easy to read as the same numerals on the front due to slightly reduced contrast.

CHF20 front:

Numerals: low contrast, difficult or impossible to read for most VI participants.



Raised-ink symbol:
not detectable for most participants.

Base color: color is distinct for those who can discriminate hues, but saturation is very similar to the CHF50 (CHF10 is lighter on the front).

Foil hologram patch:
shape not discernable for most VI participants.

Smaller Numerals:
easier to read for some VI participants due to good contrast, relatively uncluttered background.

CHF20 back:

Numerals: medium contrast, fairly easy to read for most VI participants but not ideal.

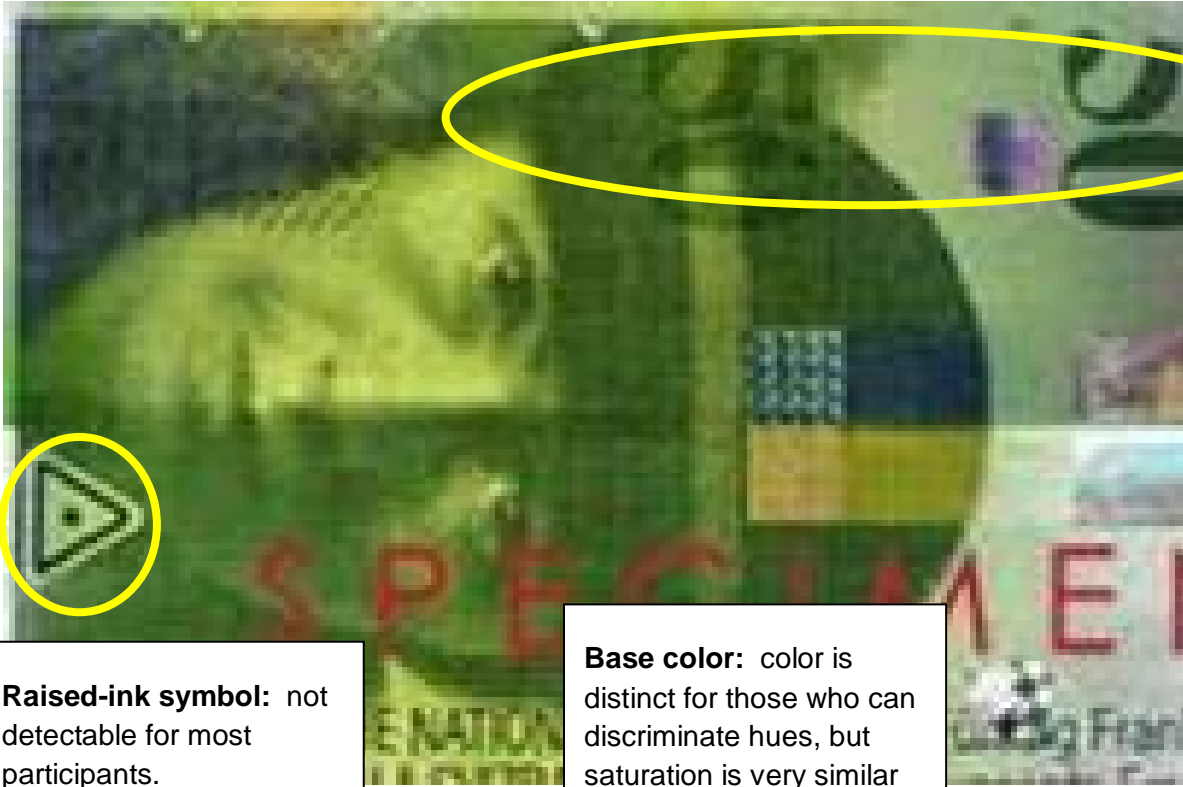


Base colors: base color provided mixed results for VI participants.

Silhouette: very similar between the three bills (both fronts), but particularly between the CHF10 and CHF20).

CHF50 front:

Numerals: low contrast, difficult or impossible to read for most VI participants.

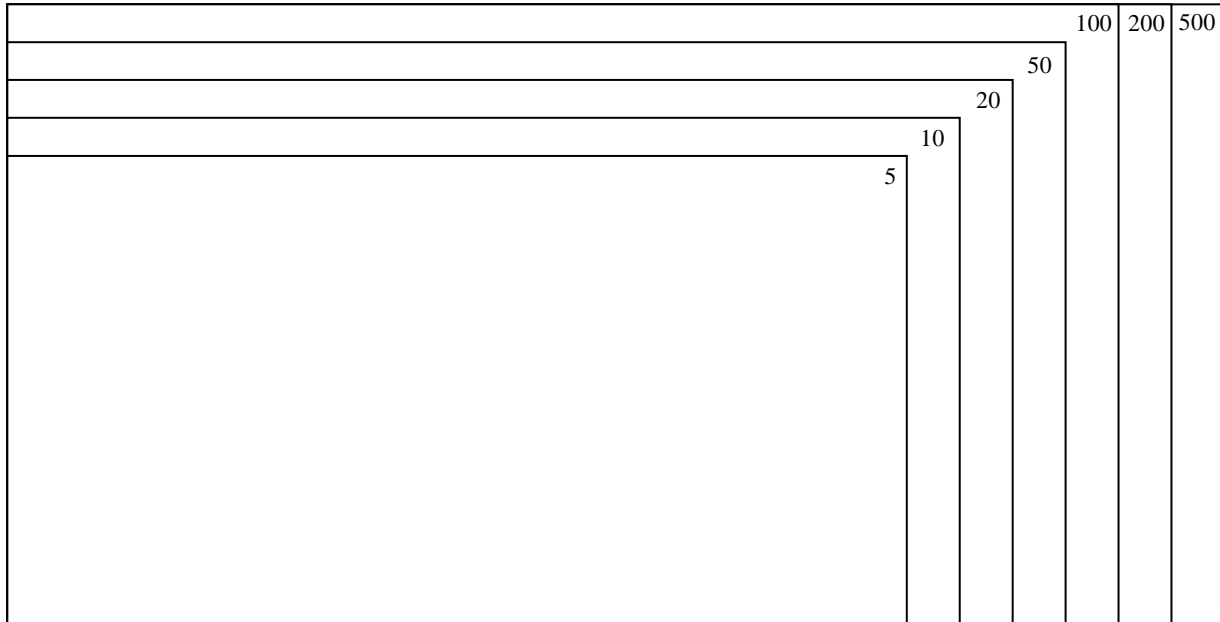


Raised-ink symbol: not detectable for most participants.

Base color: color is distinct for those who can discriminate hues, but saturation is very similar to the CHF50 (CHF10 is lighter on the front).

Euro (€)

Lower-denomination Euros vary in size by both length (7mm increments) and width (5mm increments). The €200 and €500 notes are the same width (82mm) as the €100, but 7mm longer. We did not evaluate the €200 and €500 because they are rarely encountered by the general public.

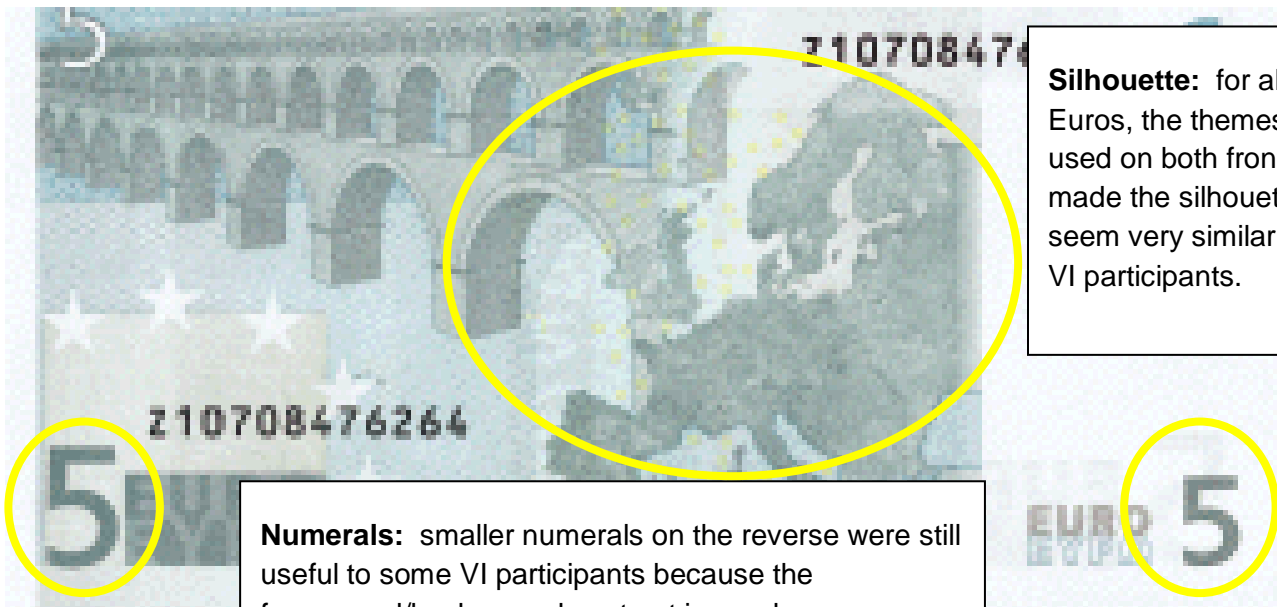


€:

Numerals: virtually no contrast means most VI participants didn't see any numeral here at all.



Base colors: all Euros had good hue separation. The backgrounds were a bit light for some participants who had color or contrast sensitivity impairment



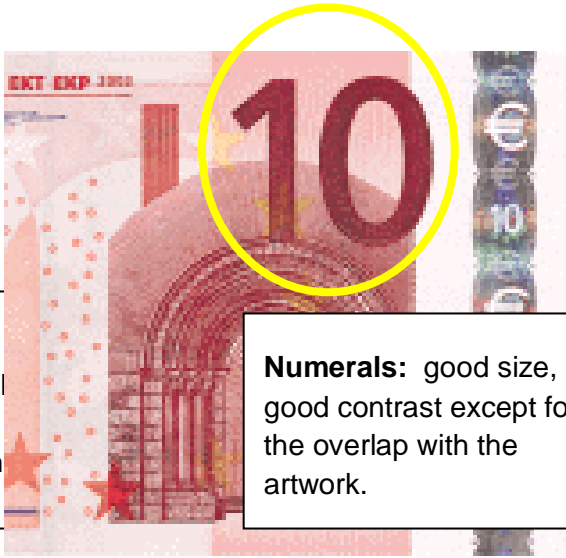
Silhouette: for all Euros, the themes used on both fronts made the silhouettes seem very similar for VI participants.

Numerals: smaller numerals on the reverse were still useful to some VI participants because the foreground/background contrast is good.

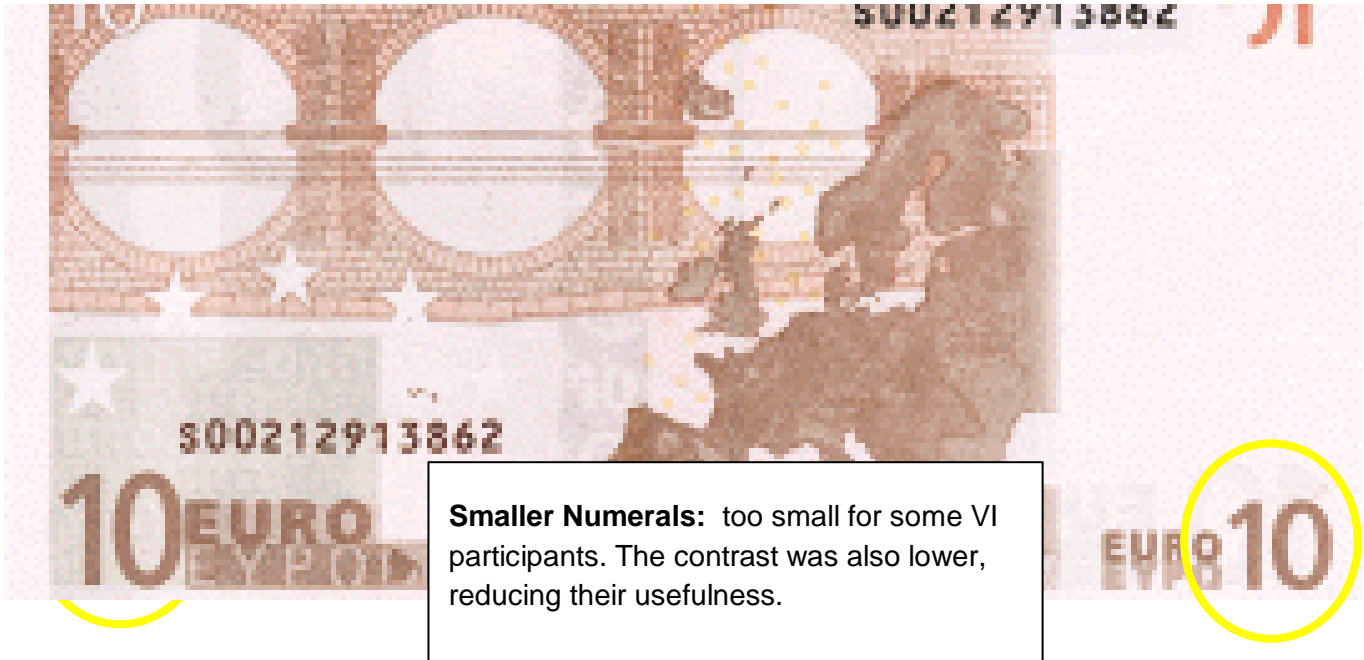
€10:



Smaller Numerals: too small for some VI participants, but the ideal contrast made them more useful than the larger numerals above the artwork.



Numerals: good size, good contrast except for the overlap with the artwork.



Smaller Numerals: too small for some VI participants. The contrast was also lower, reducing their usefulness.

€20:

Numerals: good size, good contrast except for the overlap with the artwork.



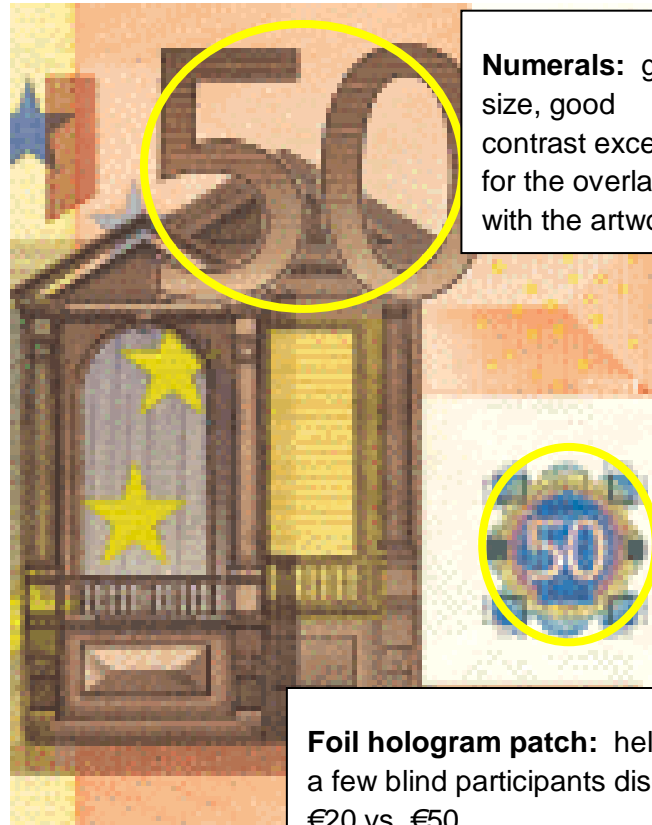
Smaller Numerals: too small for some VI participants, but the ideal contrast made them more useful than the larger numerals above the artwork in some cases.

Foil hologram strip: seemed to help a few blind participants discern €20 vs. €50.

€50:

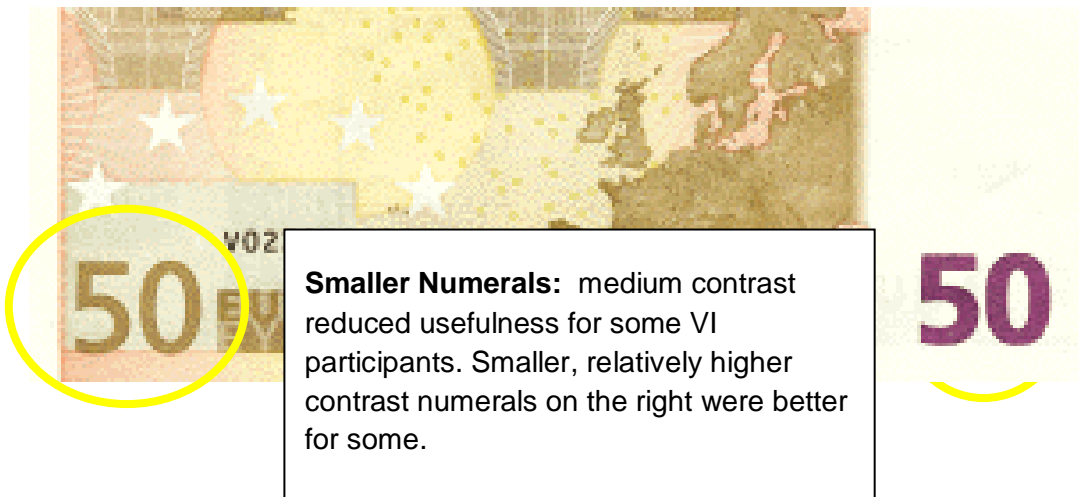


Smaller Numerals: too small for some VI participants, but the good contrast made them more useful than the larger numerals above the artwork.



Numerals: good size, good contrast except for the overlap with the artwork.

Foil hologram patch: helped a few blind participants discern €20 vs. €50.



Smaller Numerals: medium contrast reduced usefulness for some VI participants. Smaller, relatively higher contrast numerals on the right were better for some.

€100:



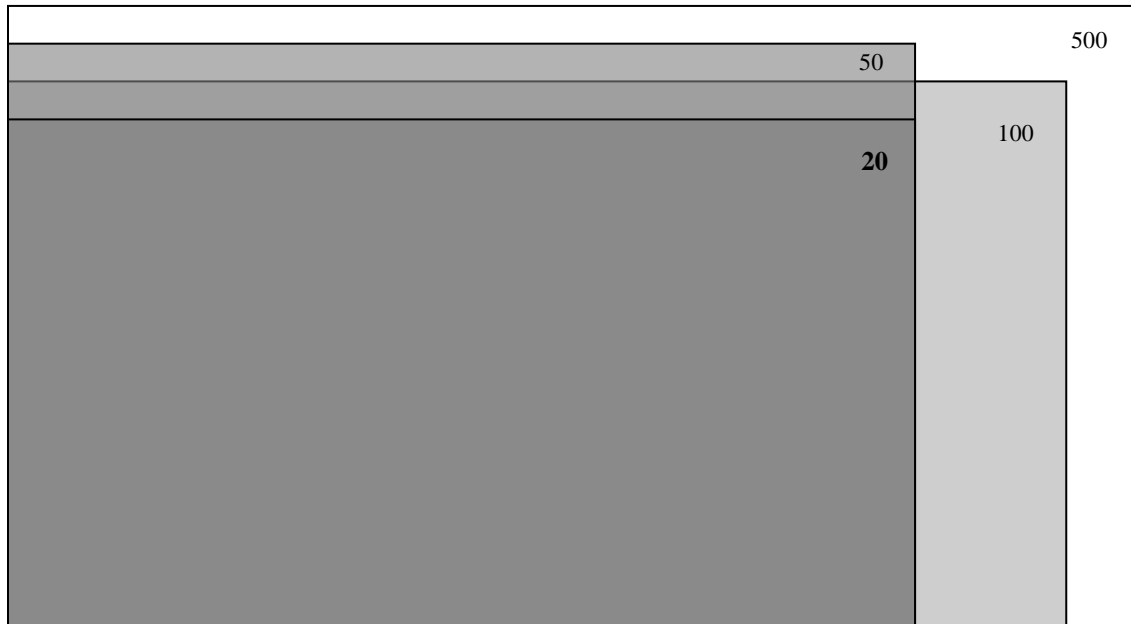
Numerals: good size, good contrast except for the overlap with the artwork.

Foil hologram patch: not as useful with the €100, which was generally recognizable by the note's size.

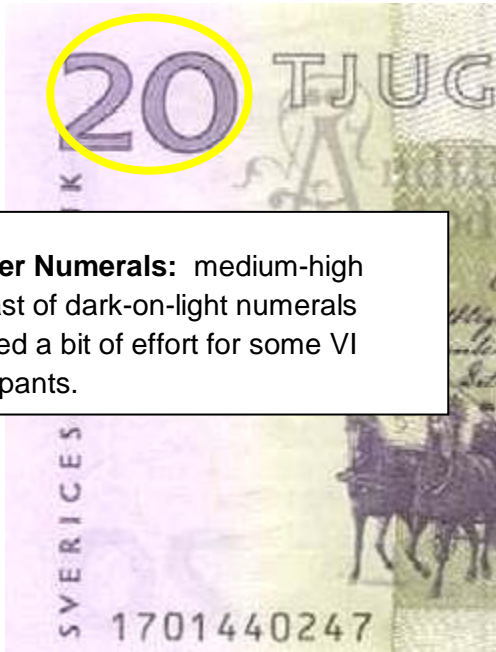
Smaller Numerals: too small for some VI participants, but the good contrast made them more useful than the larger numerals above the artwork for some participants.

Swedish Kronor (SEK)

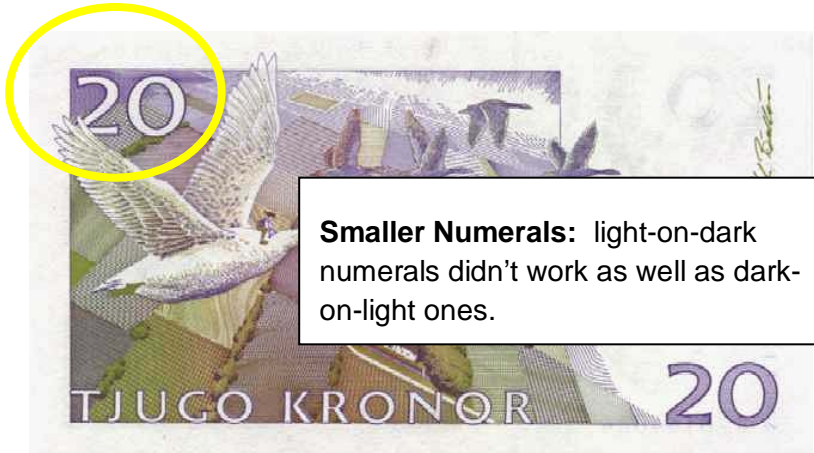
The Swedish Kronor uses a hybrid size scheme. The SEK20 is smallest at 120 mm × 67 mm. The SEK50 is the same length as the SEL20, but wider at 120 mm × 77 mm. The SEK100 is intermediate-width, but longer than either the SEK20 or the SEK50 at 140 mm × 72 mm. The SEK500 is longer than any of the others at 150 mm × 82 mm.



SEK20:



Smaller Numerals: medium-high contrast of dark-on-light numerals required a bit of effort for some VI participants.



Smaller Numerals: light-on-dark numerals didn't work as well as dark-on-light ones.

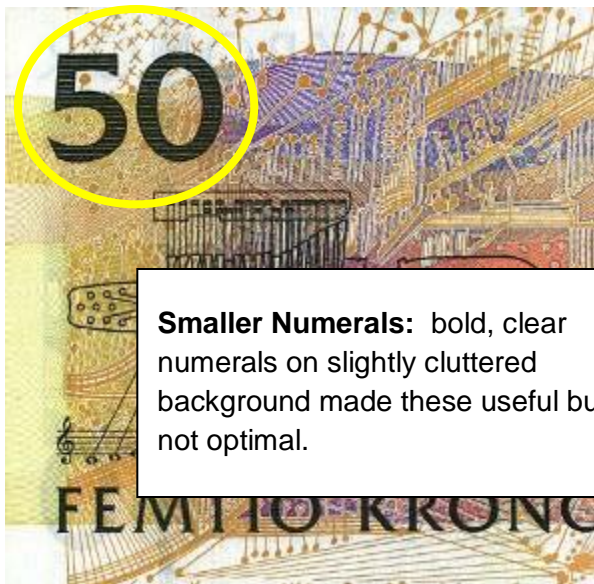
SEK50:



Base colors: sparse use of color did not help VI participants.

Silhouette: strong silhouette differences, but participants generally focused on the numerals

Foil hologram strip: the foil strip over the numerals made the contrast close to zero.

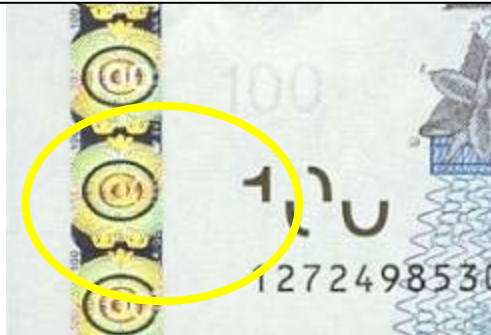


Smaller Numerals: bold, clear numerals on slightly cluttered background made these useful but not optimal.

SEK100:

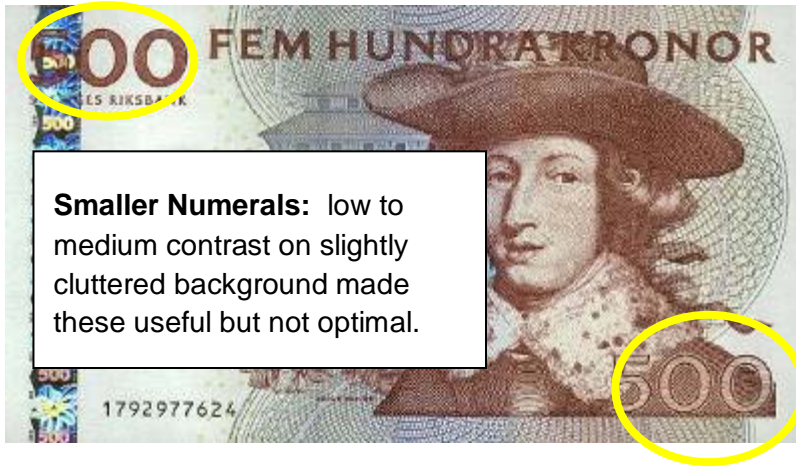


Smaller Numerals: low to medium contrast on slightly cluttered background made these useful but not optimal.



Smaller Numerals:
Medium-high contrast of dark-on-light numerals required a bit of effort for some VI participants due to the medium size.

SEK500:



UK Pound (£)

UK pounds use a size scheme similar to that used by the Euro; each higher denomination is longer and wider than the previous, in consistent increments.



£5:

Medium-size Numerals: high contrast on a clear background made these usable for virtually all VI participants.



Smaller Numerals: high contrast on a clear background made these useful for some participants. Despite the smaller size and crowded typestyle, a few VI participants found these easier than the larger numerals because the contrast was higher.

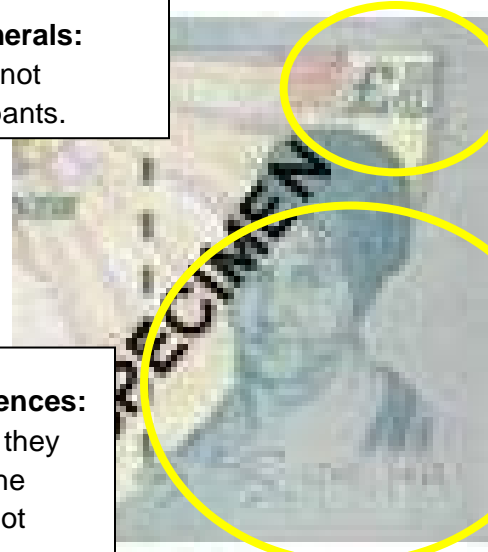


Symbols: surrounding clutter made these symbols blend into the background. While many VI participants could see them, the numerals on the same front were easier to identify.

Smaller, low contrast numerals: numerals on the back were not readable by most VI participants.



Faint base color differences: fairly well separated but they were light enough that the differences were often not helpful.



£20 (old design):

Medium-size Numerals: high contrast on a clear background made these usable for virtually all VI participants.



Smaller Numerals: high contrast on a clear background made these useful for some participants. Despite the smaller size and crowded typestyle, a few VI participants found these easier than the larger numerals because the contrast was higher.

Symbols: cluttered surrounding made these symbols blend into the background. While many VI participants could see them, the numerals on the same front were easier to identify.

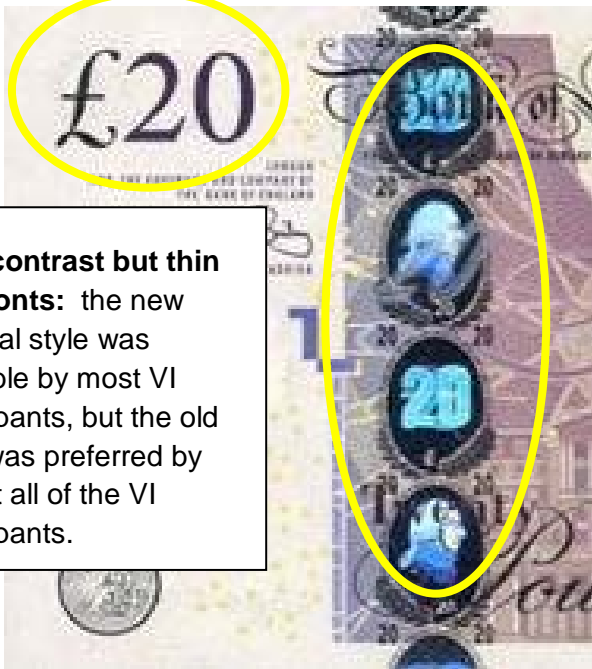


Smaller, low contrast numerals: numerals on the back were not readable by most VI participants.

Faint base color differences: fairly well separated but light enough that the differences were often not helpful.

£20 (new design):

Numeral location: the primary numerals are in the preferred location at the top.



High contrast but thin type fonts: the new numeral style was readable by most VI participants, but the old style was preferred by almost all of the VI participants.

Foil hologram strip: the foil strip, unlike the foil patches, was detectable by some blind participants and may have helped some of them discriminate the new 20 from the 10 or 50.

Low contrast, hollow, thin type fonts: some of the numerals disappeared into the surrounding art.



£50:

156mm x 85mm



Smaller, low contrast numerals: numerals on the front for the 50 were not as easily readable by VI participants as were the primary numeral on the other denominations.

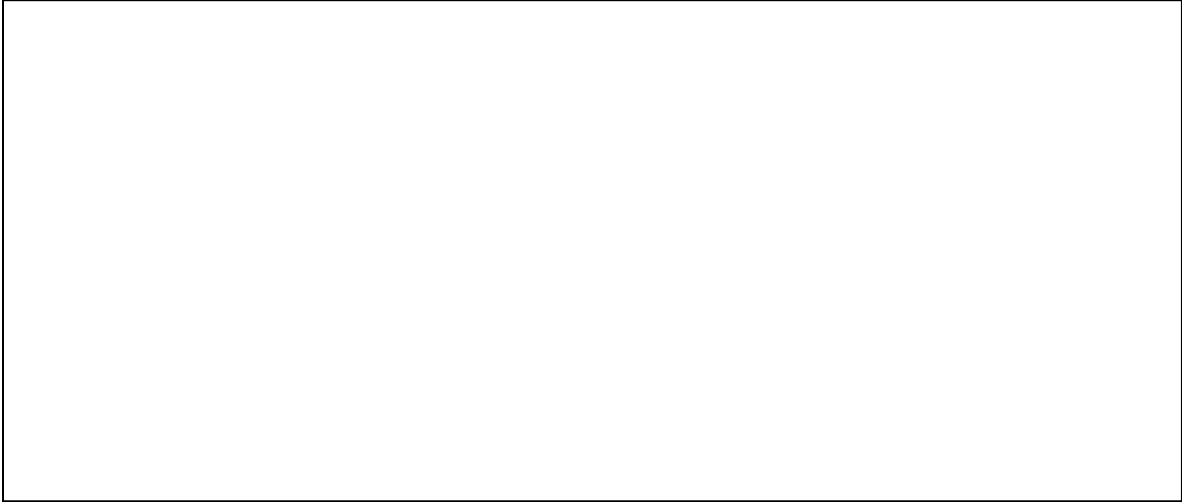
Symbols: as with the other denominations, clutter surrounding similar colors made these symbols blend into the background.



Indistinct silhouette: on both sides, the 50 £ note lacked sharp features that might aid in quick visual recognition for participants who have low visual acuity.

U.S. Dollar (\$)

All current U.S. dollars are the same size: 155.956×66.294 mm (6.14×2.61 in)



US\$1:



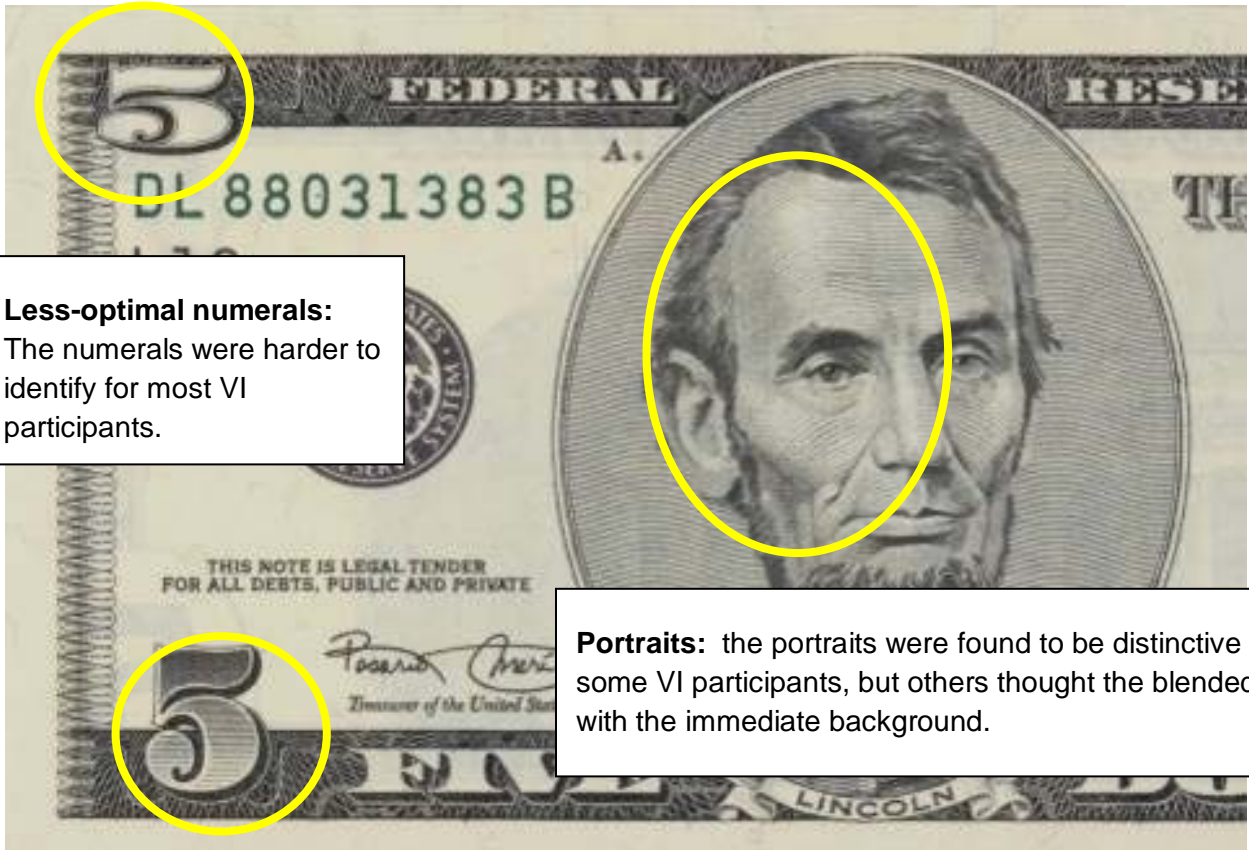
Distinctive numerals: the primary numerals on the \$1 bill are not exceptional for their high-contrast design, but they are clear enough that most VI participants can read them, and distinct enough compared to the other denominations that most VI participants can identify them.

Distinctive silhouettes: both sides of all U.S. denominations are moderately unique, with distinct variations that can be usually identified even with relatively low visual acuity. The \$1 bill is unique in the way it uses a lot of ink in a relatively solid mass.



Some VI participant said they recognize the \$1 bill by the presence of the large word "ONE" on the back.

US\$5 (old design, no background color):



Less-optimal numerals:
The numerals were harder to identify for most VI participants.

Portraits: the portraits were found to be distinctive for some VI participants, but others thought they blended in with the immediate background.



High-contrast numeral: the large '5' on the back was readable by virtually all VI participants, though it may take some time to read it. The type font is clear, with adequate "halo" space, and the foreground/background contrast is ideal.

US\$5 (new design, with background color):

Silhouette: The foreground/background separation of tinted U.S. bills is strong, however each design is the same with key elements all in roughly the same locations.



Disappearing Numeral: light foreground on light background caused the numeral to be less distinct



Silhouette: less distinct without the frame around the Lincoln Memorial and with the lightened background.

Large Numeral: the big purple '5' was visible by most VI participants, and was easier to identify than the previous (smaller, green, higher contrast) numeral for most VI participants. Many of these participants strongly appreciated the change. The big numeral also enabled arm's-length denomination for some VI participants.

However, some VI participants had greater difficulty due to problems detecting the hue, or due to the lower saturation or both. VI participants found the background tinting to slightly decreased the foreground/background contrast.

US\$10 (old design, no background color):

Indistinct numerals: the light-on-dark design of these numerals is good but the type font makes them fairly similar to the old 5 and 20 notes without background color.



Strong silhouette: optimal light/dark separation, but VI participants found the overall pattern too similar to the other denominations.

Less-optimal numerals: the dark-on-dark numerals on were less easy to identify for most of the VI participants.



High-contrast numeral: the larger numeral was readable by virtually all VI participants. The type font is clear, with adequate "halo" space, and the foreground/ background contrast is ideal.

US\$10 (new design, with background color):



Numerals: Visible numeral outline, though thin, may benefit some low vision users.

US\$20 (new design, with background color):



\$50 or \$20: many VI participants said that they sometimes confuse \$20 and \$50 bills because the large numerals look similar. This may be more frequent when viewed upside-down, which is a common way of arranging bills in a wallet, so that the large numeral is at the top for easy inventorying.

US\$100:



Similar Silhouette: for a VI participants with low visual acuity, the silhouette was found to be very similar to the silhouette of the old design \$5, \$10, \$20, or \$50.

Numerals: dark, tight, type font on dark background, made them blur together for VI participants. Many VI participants said that they identify \$100 bills by their absence of any distinct features. The effort required to be sure that they were not missing any distinct features, to ensure they were looking at a \$100 note, caused frustration.

