Designing response options for touch in mobile surveys

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Any views expressed are my own and not necessarily those of the U.S. Census Bureau.

Background

- Respondents increasingly use smartphones to complete online surveys

- Interaction with questionnaire involves touch input rather than point-and-click input

- Response selection of closed questions typically involves touching either radio buttons or check boxes, since these icons are almost universally used

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Potential Issues and Remedies

- **Small size: slower/harder to select** (per "Fitts Law")
  - Increase size of icons

- **Touch input: less precise than point-and-click input** (Forlines et al. 2007)
  - No clear remedy

- **Ambiguous selectable area**
  - Add border or "button zone" (can then either keep radio button/check box or remove it)
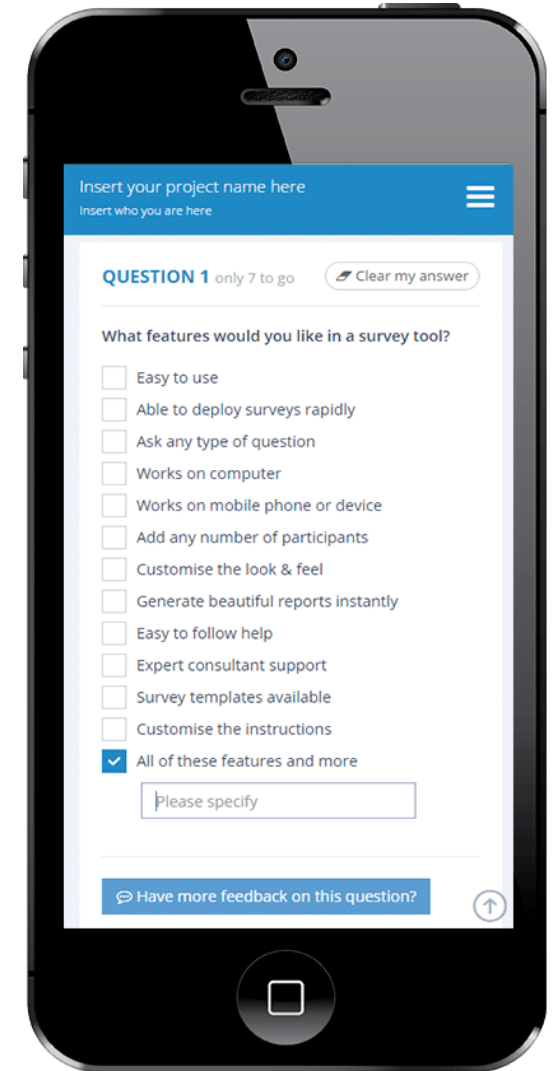
Source: Spark Chart
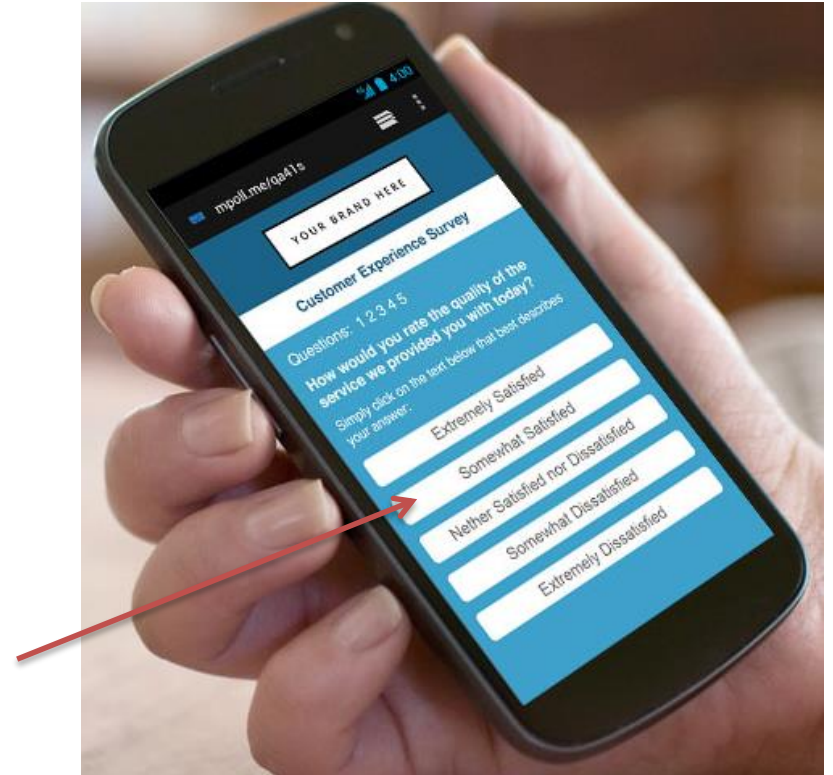
Examples
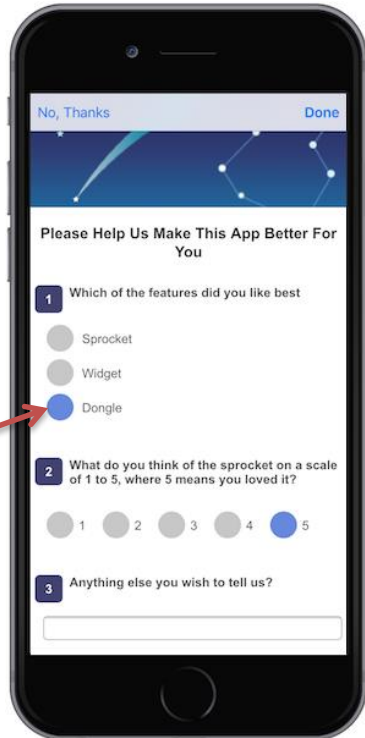
askingpoint.com

Large icons

kinesissurvey.com

Large icons with button zone
(*hybrid buttons*)

questionpro.com

Button zone and no icons
(*plain buttons*)

To my knowledge, there have been no direct comparisons between different designs

Current Experiment

Four Conditions

1. Control
- 2 mm icon

2. Large icons
- 6 mm icon

3. Hybrid buttons
- 6 mm icon
- Button zone
- Button zone changes color

4. Plain buttons
- No icon
- Button zone
- Button zone changes color

Selectable area: entire row associated with each response option

Box icons used for check-all-that-apply questions.

Data Collection

- Setting: In-person tests at community/senior centers in Washington DC area from Dec. 2016 to Jan. 2017

- Procedure
  - Participants (Ps) sequentially assigned (P1 to condition 1, P2 to condition 2…) to one of four conditions
  - P completed paper questionnaire (demographic questions)
  - Test administrator loaded survey app on iPhone 5s, handed phone to P, instructed him/her to complete survey
  - P completed paper post-survey questionnaire with evaluation questions
  - 3-4 other experiments run before or after this one

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Questionnaire

- Paging design (1 question per page)
- 26 questions, most adapted from World Values Survey
  - 20 choose-one Qs with relatively short response options
    - Ex of full scale: "1 no trust at all, 2, 3, 4, 5, 6, 7 complete trust"
  - 3 choose-one Qs with relatively long response options
    - Ex of one response option: "An employee of a PRIVATE FOR-PROFIT company or business, or of an individual, for wages, salary, or commissions"
  - 3 check-all-that-apply questions
- 7 response options per question

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Sample

- 61 older adults with experience using smartphones
  - Age: 59-80 years old (56% 59-69 years old; 44% 70-80 years old)
  - Gender: 70% female; 30% male
  - Race: 76% White; 14% Asian; 10% Black
  - Smartphone experience: 79% two or more years; 21% less than two years
- Survey data from 14 participants not available, resulting in a final sample 47 for some indicators (missing data should not affect experimental comparisons)

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Measures

- **Response behaviors (at page-level)**
  - Time per screen (N=1,161 pages after truncating at 95th percentile)   *Multi-level model*
  - Erroneous taps on screen--paradata of misses and answer changes (N=1,222 pages; DV: yes, extra tap vs. no extra tap)   *Population average model*
  - Number of categories selected for choose-all questions (141 pages)   *Multi-level model*
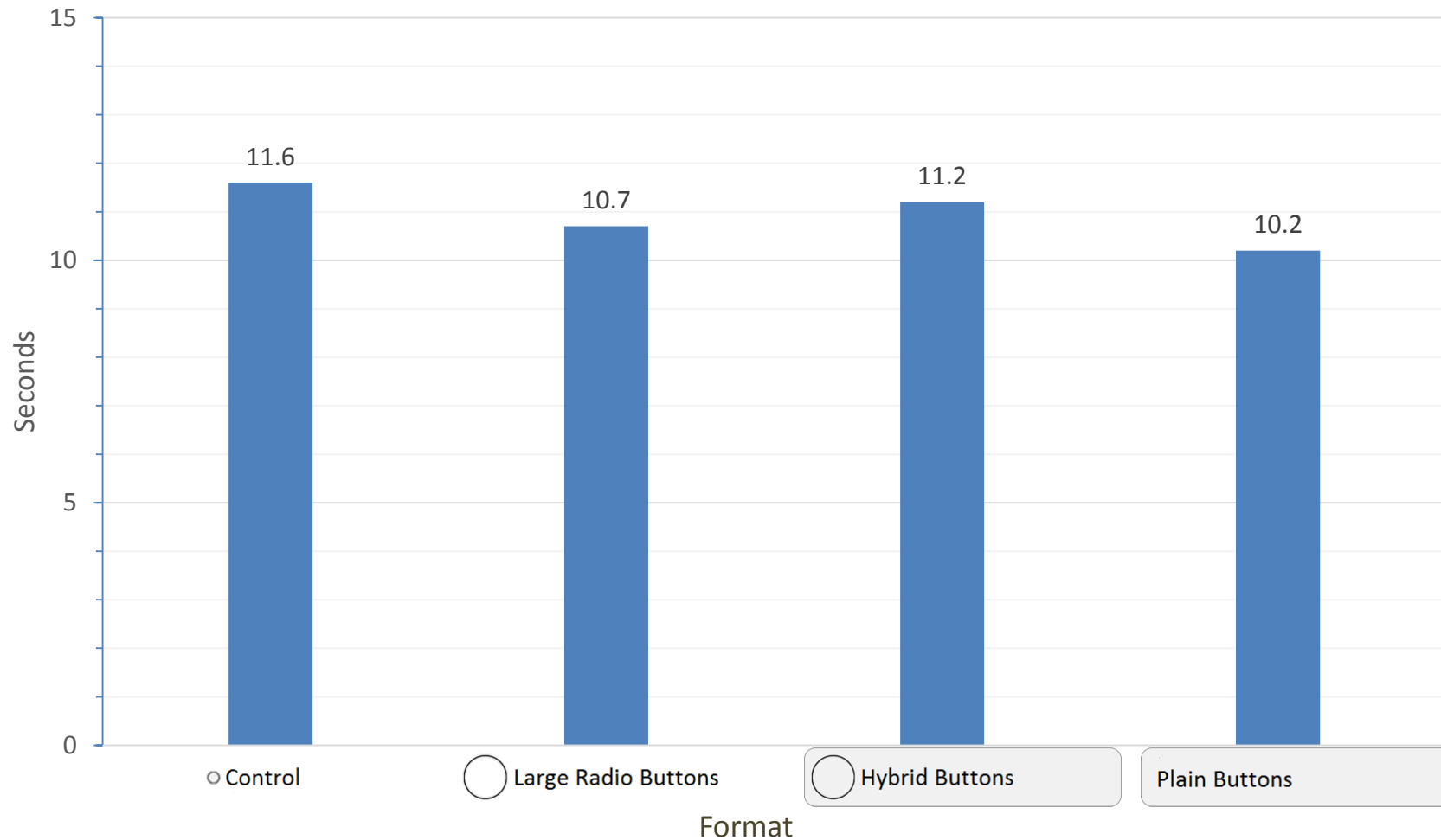
- **Post-survey ratings (at participant-level)**
  - Self-reported ease of tapping an answer (N=61)
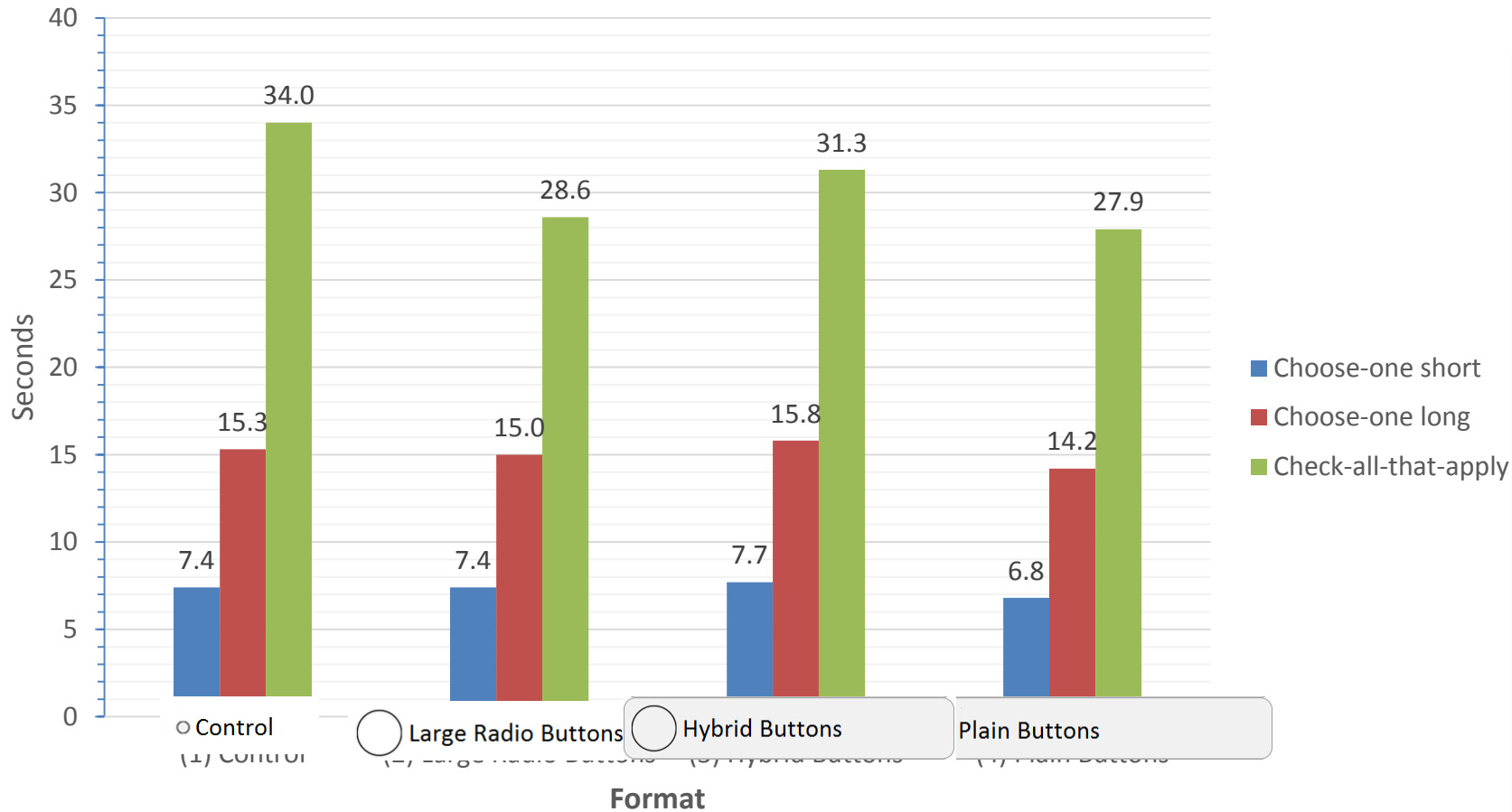 - Preferred design after seeing all four (N=61)

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Results

Mean Time per Page in Seconds

Model results

- Overall F test: $F = .76$, $p = .52$
- Slope coefficient for Plain Buttons (vs. control): -1.4, $p = .22$

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12

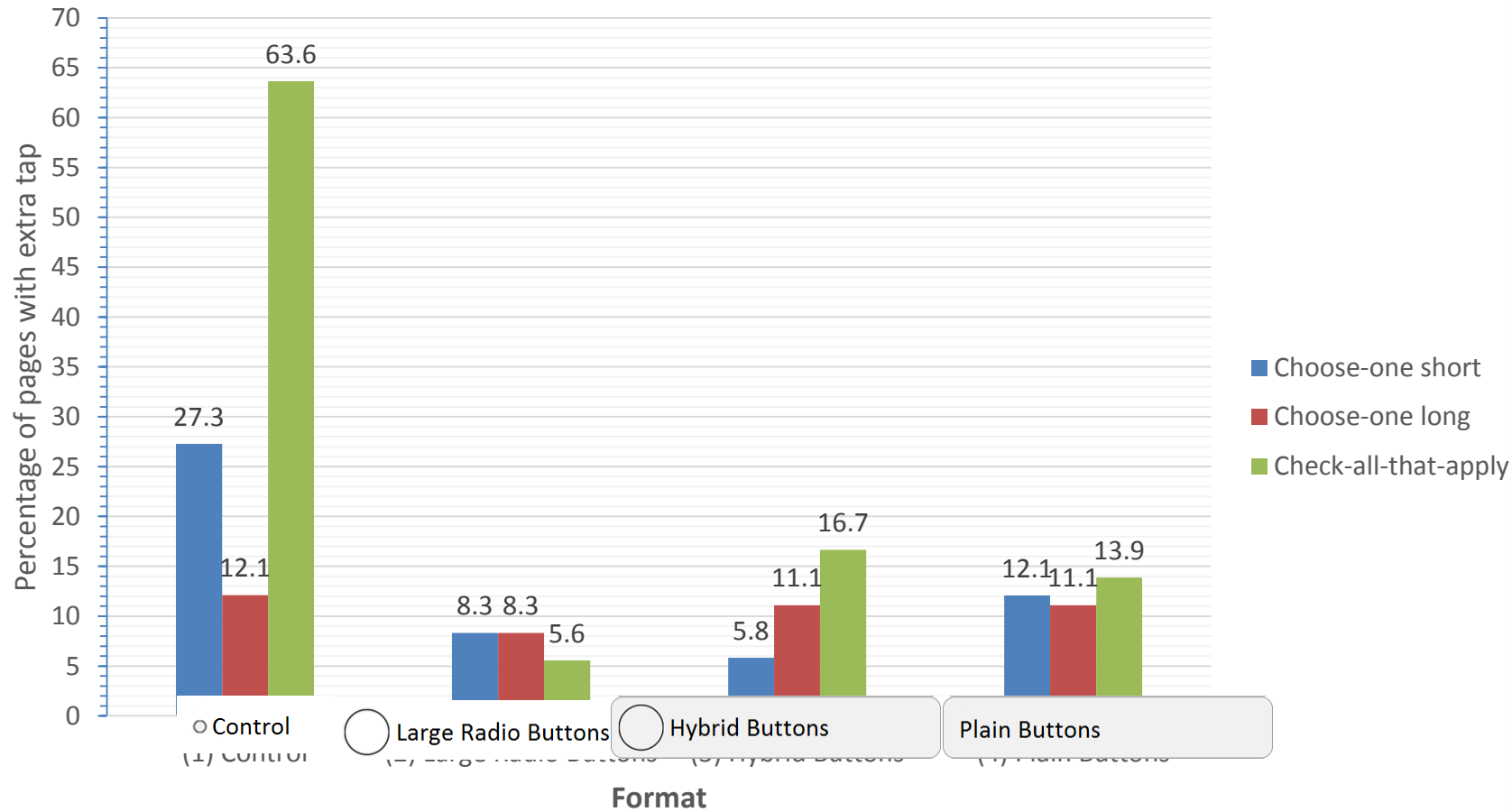# Mean Time per Page by Question Type

Model results
- Question type: $F = 994.3$, $p < .01$
- Question type × response format: $F = 2.98$, $p = .01$

13

Percentage of Screens with an Erroneous Tap (miss, answer change)
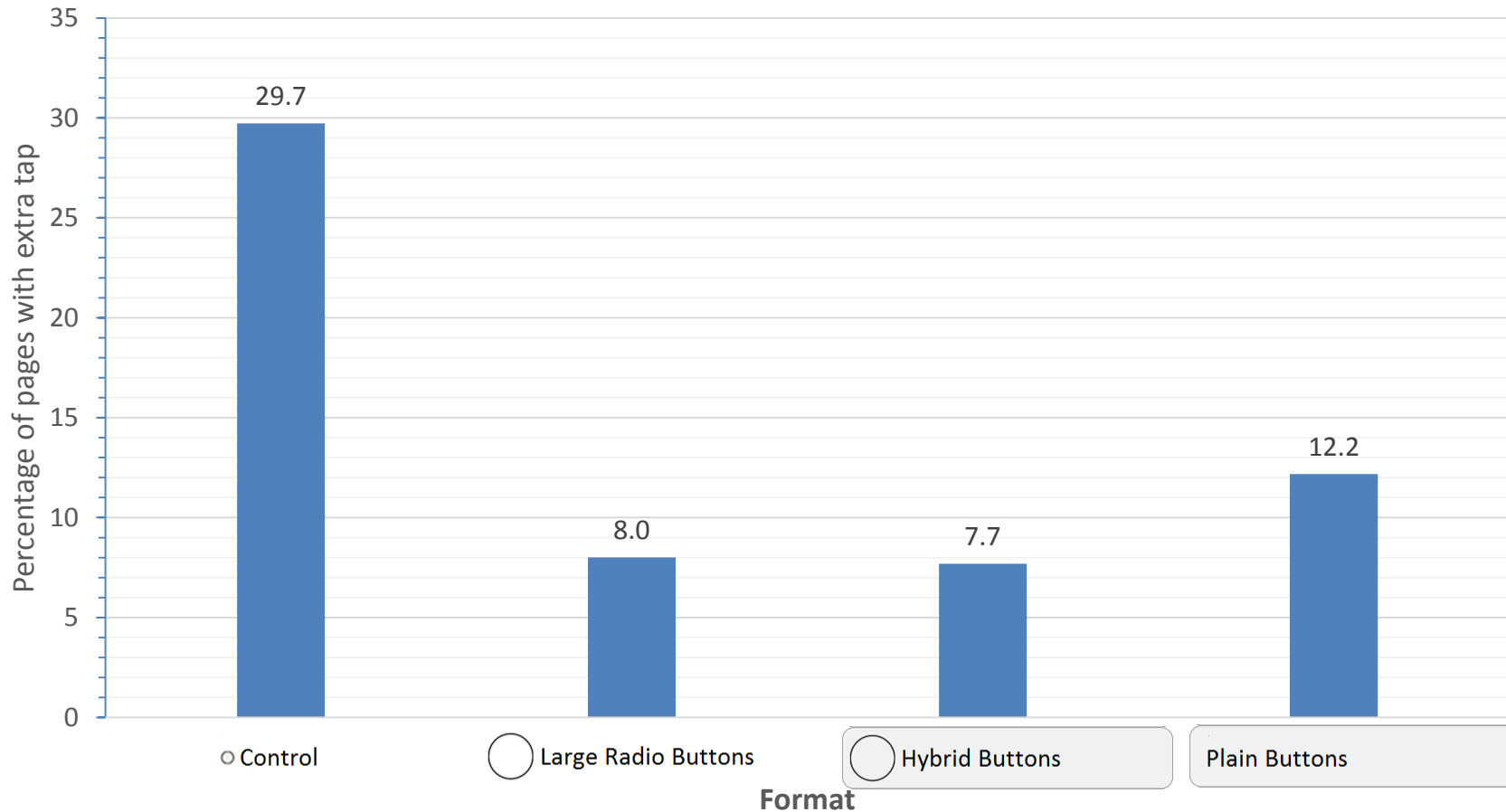
- Pairwise comparison (1 vs. 2, 3, or 4): $p < .05$
- Pairwise comparison (2 vs. 3; 3 vs. 4): p = n.s.

Erroneous Tap (percentage) by Question Type

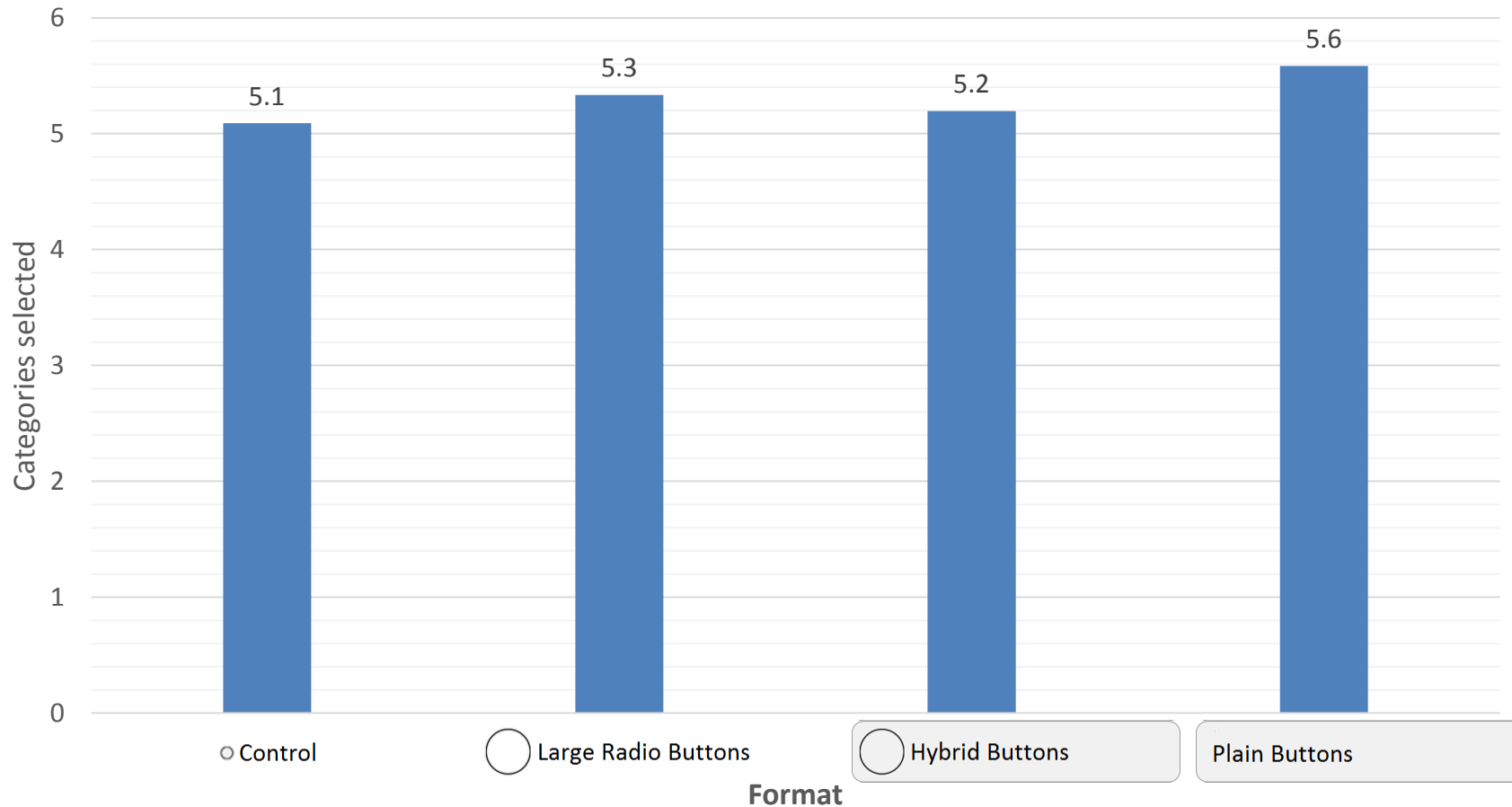**Model results**
- Question type: Check-all > choose-one long or short ($p < .05$)
- Question type × response format interaction ($p < .01$)

Legend:
- Choose-one short
- Choose-one long
- Check-all-that-apply

Chart data:

Format	Choose-one short	Choose-one long	Check-all-that-apply
Control	27.3	12.1	63.6
Large Radio Buttons	8.3	8.3	5.6
Hybrid Buttons	5.8	11.1	16.7
Plain Buttons	12.1	11.1	13.9

Y-axis: Percentage of pages with extra tap
X-axis: Format

(1) Control   (2) Large Radio Buttons   (3) Hybrid Buttons   (4) Plain Buttons

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Average Number of Categories Selected
(across 3 check-all Qs w/ 7 categories each)

Overall F test: $F = .24$, $p = .87$

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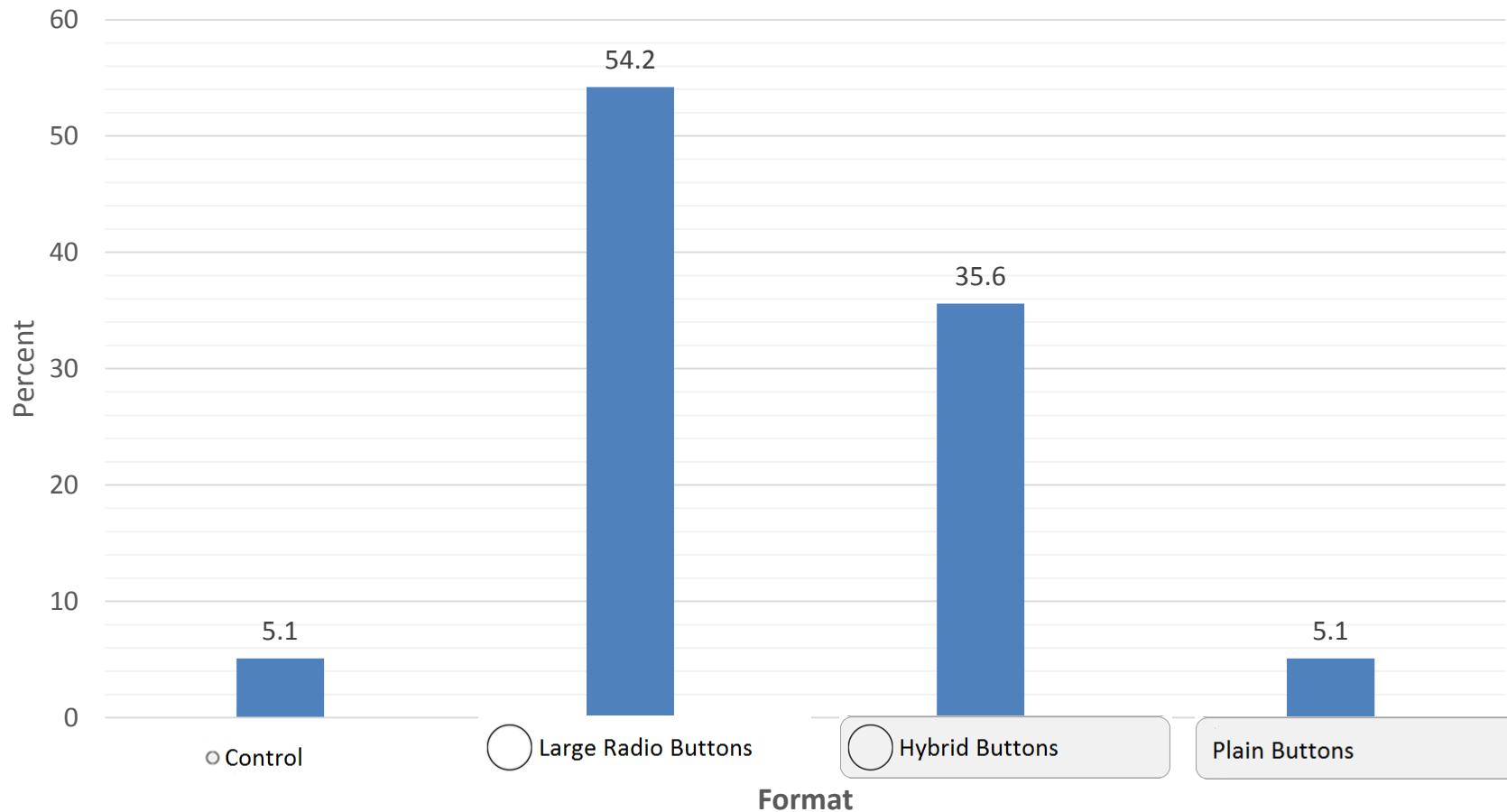U.S. CENSUS BUREAU
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Percent who Reported that it was "Very Easy" to Tap Answer
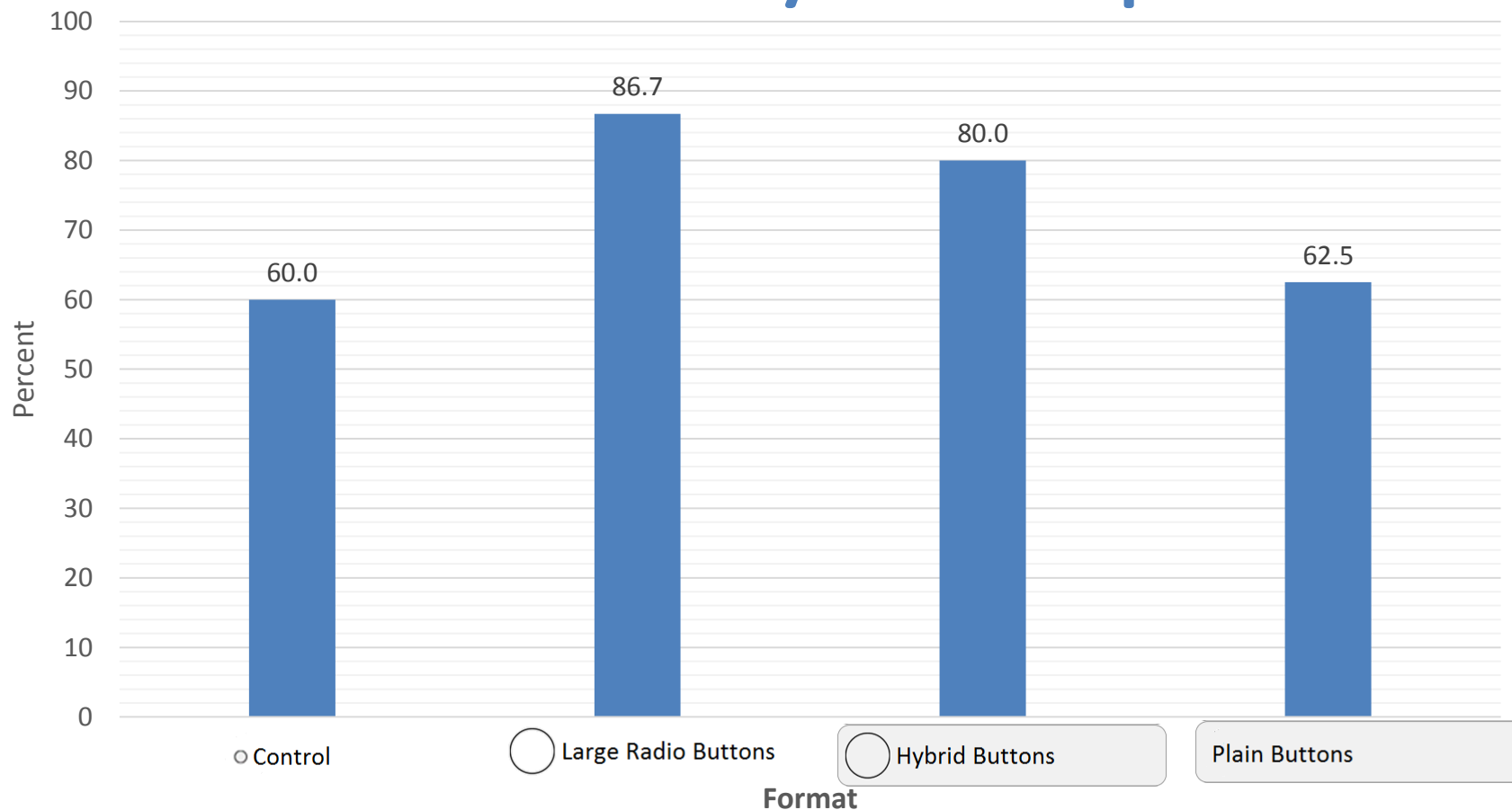
- Overall chi-square test: $\chi^2(3) = 3.9$, $p = .28$
- Pairwise comparison (1 vs. 2): $p = .10$

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Preferred Design (after seeing all four)

- Overall chi-square test: $\chi^2(3) = 41.54$, $p < .01$
- Pairwise comparisons: (1 or 4 vs. 2 or 3): $p < .01$; (2 vs. 3): $p = .13$

Reasons for Preference

- Among those preferring large radio buttons…
  - 72% mentioned something related to design being *clearer/simpler/easier*
  - 31% mentioned bigger size (compared to control condition)
- Among those preferring hybrid buttons…
  - 71% mentioned something related to *feedback that answer is selected* or *it being easy to see selection*

Summary

- **First remedy – to increase size of icons – seemed to help**
  - Larger icons reduced number of erroneous taps and were preferred to smaller icons

- **Second remedy – to add button zone – did not seem to help**
  - Button zone provided little or no additional benefit but also no harm as long as icons were retained. Ps seemed to like that the button zone changed color upon selection

Conclusions

- There is still a place for radio buttons/check boxes in mobile, so long as they are sufficiently large
  - They seemed to be easy-to-select and well-liked
  - Format without radio buttons/check boxes was not well-liked
- No apparent need for buttons zones
  - They add clutter
  - Additional programming
  - Introduce design difference between mobile and PC surveys

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Caveats

- Limited statistical power to detect differences

- Unclear if results generalize to younger adults

- Not a full factorial experiment with several different factors, only tested three alternative designs

  – There are other possible formats. Ex: Large radio buttons/check boxes with color feedback

    ○ 2   ● 2
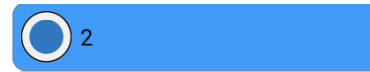
Thank you. Questions? Email:
christopher.antoun@census.gov