# Does Touchpad Size Have an Effect on the Input Area for Basic Tasks?

Angela Avera[1], Maria Natalia Russi-Vigoya[2], Stephen Stoll[2] & Christy Harper[2]

University of Texas[1] at Austin & Hewlett Packard[2]

## ABSTRACT

With the introduction of gestural input, many laptops are now being designed with larger touchpads in order to allow for the most accurate use of these features. Vendors have recommended surface input area sizes ranging from 60mm(w) x 45mm(h) to 105mm(w) x 65mm(h) and larger. However, as touchpads have continued to grow, it has been discovered that large touchpads can sometimes cause usability issues from unintended cursor movements From observing users over time we have noticed that people tend to focus input in the center area of the touchpad, regardless of touchpad dimensions. Therefore it is questionable whether continuing to increase the size of touchpads is necessary. To answer this question, we have conducted a study using two touchpads with the same surface materials, one with the dimensions of 140mm(w) x 65mm(h) and one with the dimensions of 95mm(w) x 63mm(h). We found that the size of the touchpad did not have an effect on the input area used for basic tasks.

## INTRODUCTION

- Current touchpads have grown to dimensions of 140mm x 65mm and these larger sizes can sometimes cause usability issues from unintended activation of gestures (Burks, 2015)
- Puspasari and Lee (2012) indicated that larger touchpads can sometimes give users advantages in primary movement, however the largest touchpad analyzed was 100mm x 60mm
- Previous research has shown that users do not take advantage of additional input space for basic tasks when using trackpads (Camilleri, Chu, Ramesh, Odell & Rempel, 2012), but no studies were found that specifically looked at integrated touchpads

**Objective**: To determine if the current larger touchpad size has an effect on the input area people use when performing basic pointing tasks

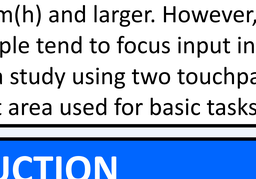
## METHODOLOGY

**12 Participants**

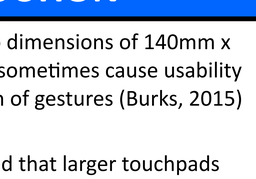
- Primarily laptop users
- Use touchpads without buttons as their main input device
- Gender: 6 males and 6 females
- Ages: 18-20 (2), 21-30 (8), 41-50 (1), 50+ (1)

**Equipment**

- Two laptops:
  - HP Spectre: 95mm (w) and 63mm (h)
  - HP Spectre X2: 140mm (w) and 65mm (h)



- Software: TPBenchmark Tool (Synaptics) that recorded X and Y coordinates of input on the touchpad every tenth of a second

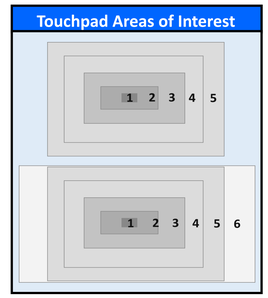


**Procedure**

- Demographic information was recorded
- Participants were guided to complete a pre-designed point and click task
- All tasks were presented in counter-balanced order

## RESULTS

The touchpad areas of interest (AOI) were defined based on previous research (Camilleri et al., 2012) and observations of common user experience (Harper, 2015)




**For each touchpad**

- Touches per square unit ($mm^2$) were calculated by summing the touches on each area and dividing them by the total area of the AOI
- Shapiro-Wilks test was run to determine whether the AOIs were normally distributed ($\alpha = 0.05$)
- The Friedman test was run to determine the significant differences of touches per square unit ($mm^2$) on each area
- Fisher's LSD was run to compare the significant differences between individual AOIs on each touchpad

**To compare touchpads to one another**

- The Friedman test was run to determine the significant differences of touches per square unit ($mm^2$) per area on both touchpads

**Small Touchpad**

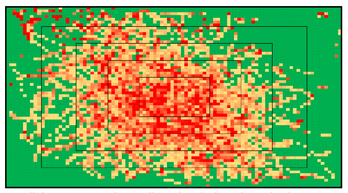
Participants touched some AOIs more than others ($p < 0.05$)

- Participants focused their touches on areas 1 and 2 equally. Their touches became less frequent further from the center areas 1, 2, and 3

**Touches on Small Touchpad**

| Area | Groupings | Average |
|---|---|---|
| 1 | A | 1.15 |
| 2 | A | 0.82 |
| 3 | B | 0.46 |
| 4 | C | 0.25 |
| 5 | C | 0.15 |

Note: Letters that are the same are not significantly different from each other



All data points on the small touchpad. The color red indicates more touches from participants.

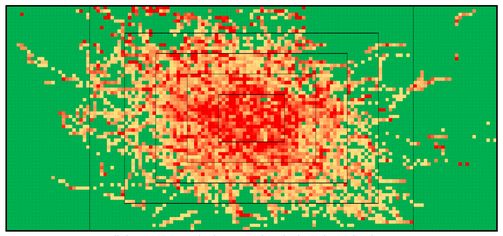
**Large Touchpad**

- Participants touched some AOIs more than others ($p < 0.05$)
- Participants focused their touches in areas 1, 2, and 3 equally and touches became less frequent further from the center areas.
- Area 6 was used sparsely

**Touches on Large Touchpad**

| Area | Groupings | Average |
|---|---|---|
| 1 | A | 1.32 |
| 2 | A | 0.96 |
| 3 | A | 0.58 |
| 4 | B | 0.34 |
| 5 | C | 0.19 |
| 6 | D | 0.05 |

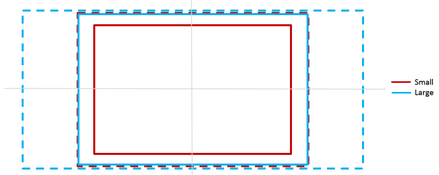
Note: Letters that are the same are not significantly different from each other



All data points on the large touchpad. The color red indicates more touches from participants.

**How similar are the touches on both touchpads?**

- There was no significant difference in how participants touch the small and large touchpads ($p > 0.05$)
- Regardless of touchpad size, users had more frequent touches in areas 1, 2, and 3. Their touches per square unit became less frequent further from the center areas 1, 2, and 3
- Approximately 60-65% of touches on both touchpads occurred within the center areas 1, 2, and 3 and 30-35% of touches on both touchpads occurred within areas 4 and 5
- Approximately 5% of touches on the large touchpad occurred within area 6
- Approximately 95% of touches on the large touchpad occurred within the area of the small touchpad




Touchpad width and depth containing 95% of touches. Dashed lines represent the boundaries of the touchpads and solid lines represent the areas of use (95%).

## DISCUSSION AND CONCLUSION

- Before understanding touch performance and preference, it is important to understand touch input while performing basic tasks (i.e., a basic pointing task)
- Touchpad sizes have grown to dimensions of 140mm x 65mm and these larger sizes can sometimes cause usability issues from unintended cursor movement and taps (Burks, 2015)
- Some researchers have explored the performance and usability of the previous called large touchpads (Puspasari & Lee, 2012), other researchers have explored larger external trackpads (Camilleri et al., 2012), but they have not explored the ones integrated in today's laptops
- This study showed that when participants performed basic pointing tasks, they used very similar areas of the touchpad regardless of the touchpad size. For both touchpads, participant touches became less frequent from the center areas (1, 2, and 3) out, meaning area 5 was touched less frequently than areas 1, 2, 3, and 4. Area 6 on the large touchpad was used sparsely
- The size of the touchpad did not have an effect on the input area used for basic tasks

## FUTURE WORK

- Investigate area usage on the touchpad during other common tasks (i.e., dragging, pinch-zoom and two-finger scrolling tasks)
- Analyze performance differences between both touchpads sizes during the different tasks

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## REFERENCES

Camilleri, M., Chu, B., Ramesh, A., Odell, D., Rempel, D. (2012). Indirect touch pointing with desktop computing: Effects of trackpad size and input mapping on performance, posture, discomfort, and preference. Proceedings of the Human Factors and Ergonomics Society, 56th annual meeting. Boston, MA.

Puspasari, M. A., and Lee, Y. H. (2012). Factors affecting performance of target acquisition task for touchpads. International journal of technology, 2, 145-159.

Rick, B. (2015, May). Interview with Lead and HF specialist at Hewlett Packard Company [Personal interview].

Harper, C. (2015, April). Interview with UX/HF manager at Hewlett Packard Company and Human Factors Specialist [Personal interview].