Hurry Up! Crosswalk Timing at the Boston Children's Intersection

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"The light seems short"

Almost everyone reading this sentence has crossed the Boston Children's (BCH) traffic stop. Located at Longwood Ave and Blackfan St, we estimate that the intersection serves 4,000 people per day. This includes multitudes of medical staff, students, patients, as well as wheelchair users, large carts, and delivery trucks. The authors of this study noted that the walk interval for this specific intersection seemed shortened. The location and importance of this intersection warranted further investigation.

Figure 1. Authors of this study, Sorcha (A) and Arnav (B), waiting at BCH traffic light stop after Trader Joes run on 12/15/2024.

Intersection Characteristics

The BCH intersection has two sister intersections on Longwood Avenue; we refer to them the Galleria and the DFCI intersection (**Figure 2**). These intersections serve as a comparison for the Longwood light cycle.

Figure 2. Map of Longwood intersections, labelled. Maps were made with arcGIS, provided by Harvard University license.

Despite similar sizes (max crosswalk lengths—BCH intersection: 15.5m by 15.6m, Galleria: 17.7m by 12.7m, and DFCI: 19m by 19.5m), the three sister intersections have different light cycles. We determined this by observationally sampling light cycles at the traffic stops. Of note, these sites are each governed by consistent light cycles that are not dependent on car-volume / time of day. We observed that the BCH intersection has a significantly lower walk cycle time while retaining a similar total light cycle length (**Table 1**).

	DFCI	Galleria	BCH
total walk cycle	24	23	16
(countdown)	(16)	(14)	(10)
stop cycle	93	93.5	101.5
total cycle length	117	116.5	117.5

Table 1. Time-course of light cycles for BCH intersection and two sister intersections. Countdown refers to time within walk cycle during which flashing hand is shown. All time in seconds.

Required Walking time to cross

We then calculated the required speed necessary to cross the intersections in time. Having determined the light cycle for all intersections (**Table 1**), and after collecting the straight-line distances for diagonal, vertical, and horizontal crossings via Google Maps, we computed the minimum straight-line crossing speed. Note that this accounts for the **total crossing time,** not solely the **flashing light time.** We used previously known models of known walking time for healthy adults[1], seniors (60+)[1], and children (5–6-year-olds)[2] to contextualize the walking speeds, demonstrating that the total walk time appears insufficient for multiple populations, particularly elderly individuals and young children; however, the BCH intersection stands out in each category as requiring the highest speeds for any specific crossing pattern—particularly for the diagonal cross (**Figure 4**).

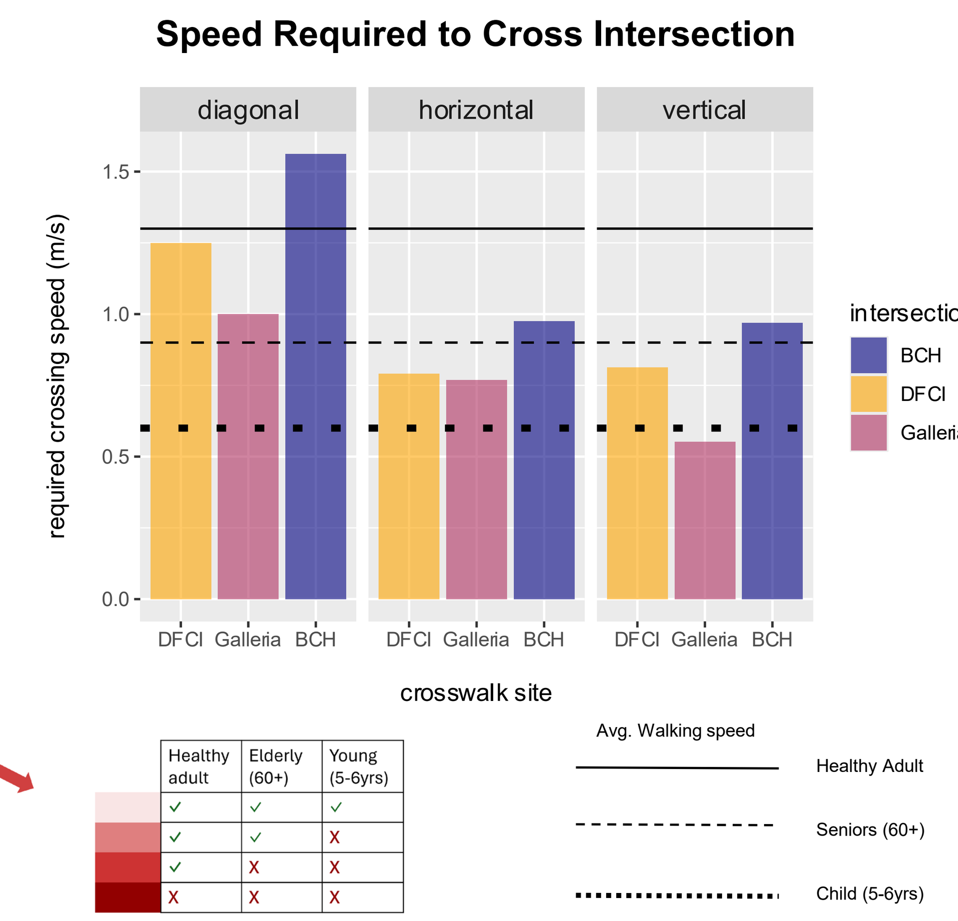


Figure 3. Minimum straight-line crossing speed at intersections. Time calculated from **total crossing time,** not solely the **flashing light time**. Horizontal lines indicate the average walking speeds of different populations.

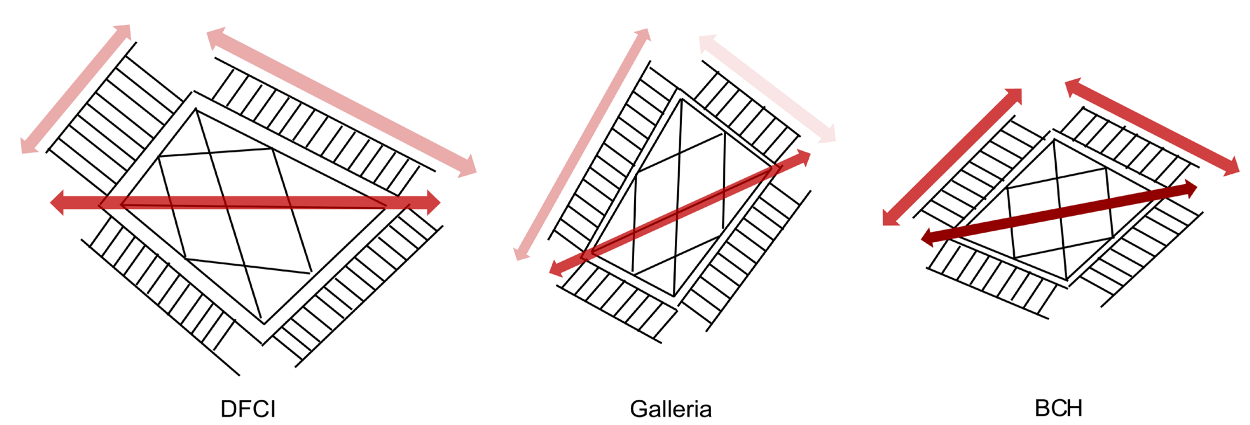


Figure 4. Diagram of ability to cross intersection for different populations. Diagrams are to scale.

An Observational Pilot Study

The BCH intersection contained a convenient sampling location from which to assess the numbers of people who were able to successfully cross the intersection. On two evenings, we sampled walking patterns at the intersection (**Figure 5A**), collecting data on all walkers who initiated their walk before the flashing hand sign (**Figure 6**). We observe that most walkers can cross horizontally (97.4%) but the proportion of successful diagonal crossers is lower (46.1%) (**Figure 5B, 7**).

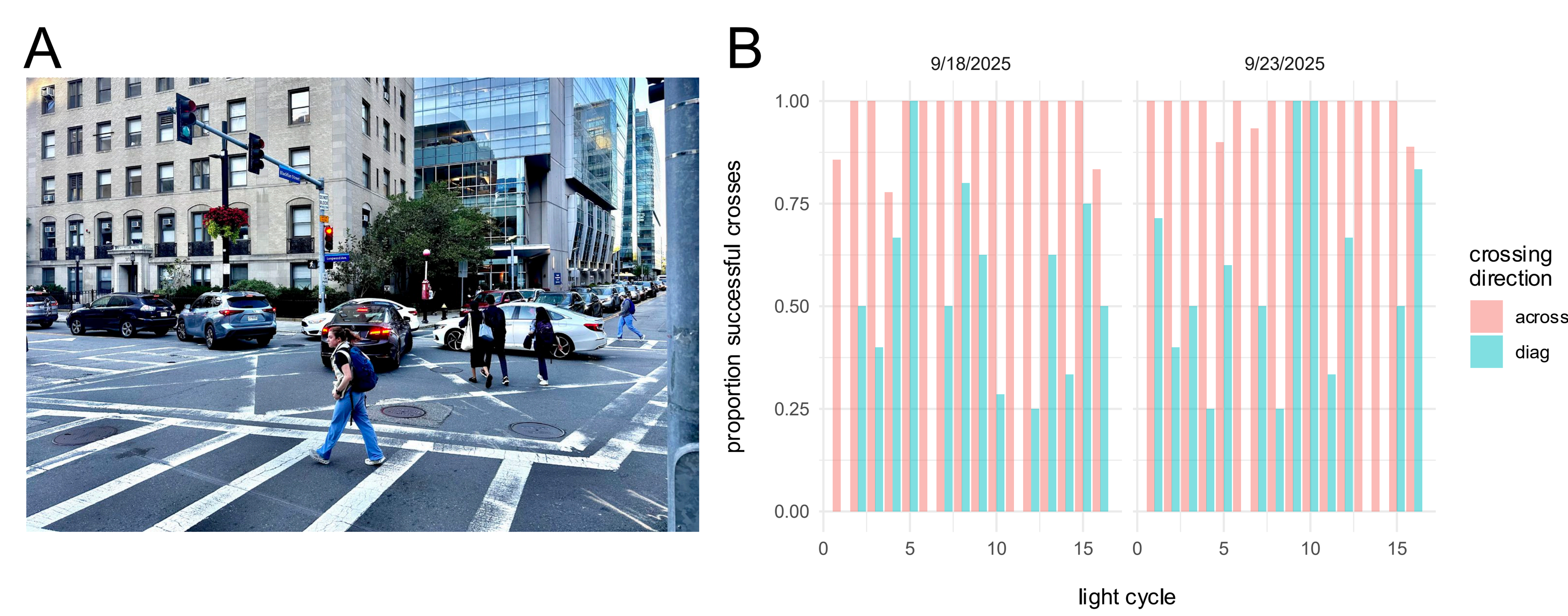


Figure 5. (A) Vantage point of BCH intersection for analysis. (B) Proportion of crossers who are able to successfully cross the entire intersection within the allotted time (all crossers in this study began crossing before the flashing hand sign). Vertical/horizontal crossers are collated into one set ("across") and both diagonals are collated into another set ("diag").

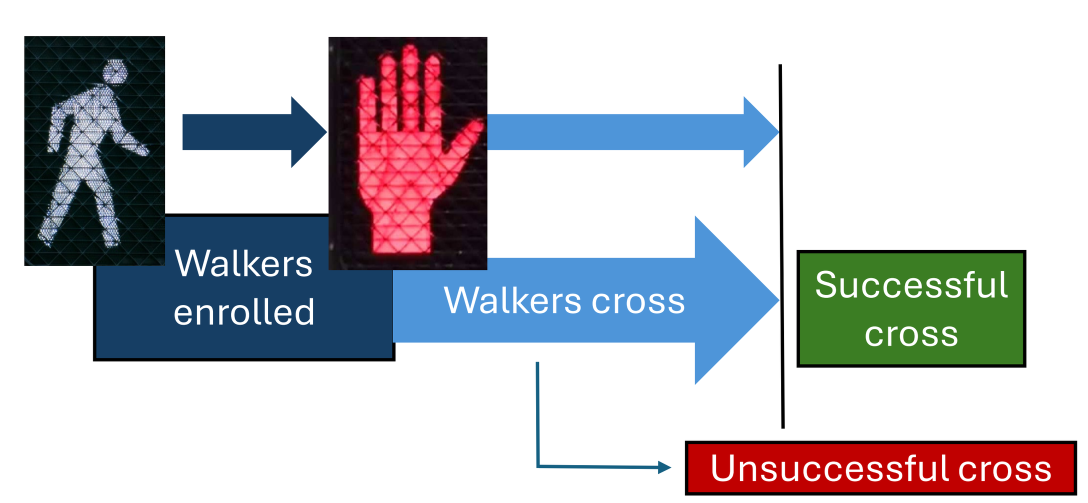


Figure 6. Schematic for enrollment in observational study. Walkers were enrolled if they began crossing between the start of the walk interval and the beginning of the flashing hand sign. A walker's cross was counted "successful" if they were able to cross the intersection by the time the flashing hand reached 0.

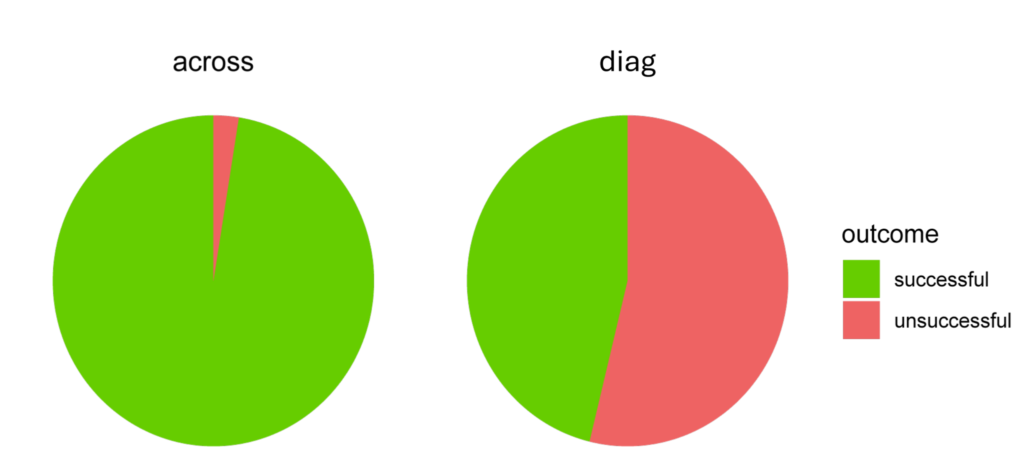
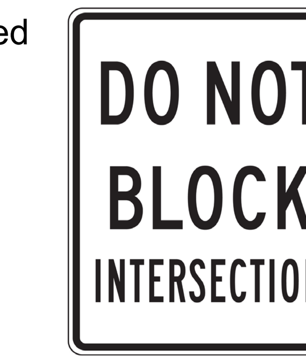


Figure 7. Pie chart of proportion of walkers who were able to cross the BCH intersection successfully for horizontal/vertical crossers (left) and for diagonal crossers (right).

Obstacles in the Walking Path

Despite the "do not block" sign (see right), we observed a number of cars that stopped in the middle of the intersection during the walking time. This particularly affects diagonal crossing. We simulated crossing the intersection with obstacles **(Figure 8A)**; this significantly extended the distance traversal required for a diagonal cross by 15%, on average, to a maximum distance extension of 30% **(Figure 8B)**.



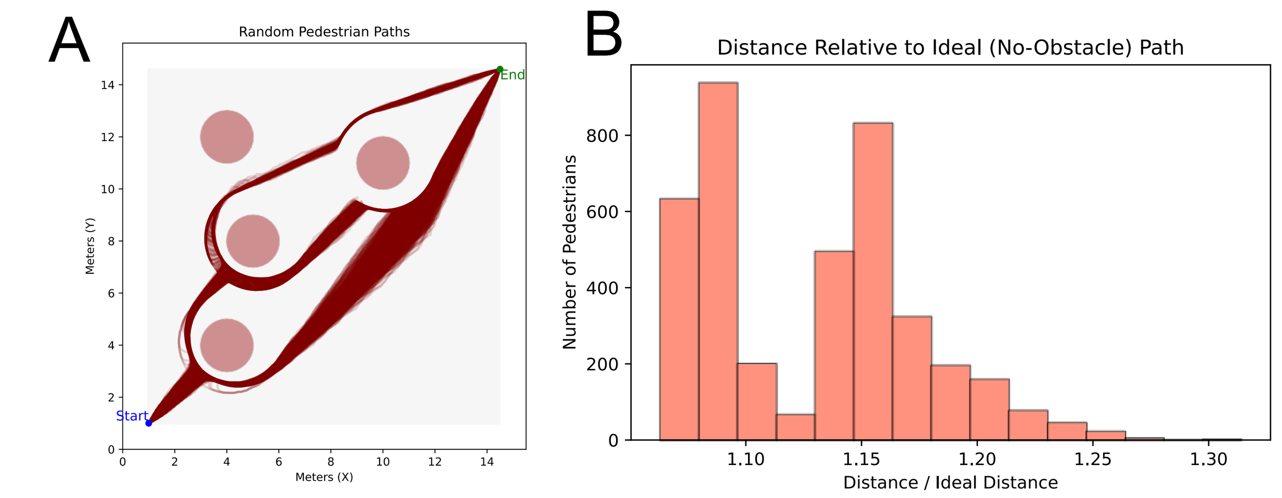


Figure 8. (A) Visual of simulation with 4,000 walkers across the diagonal of a theoretical 15m x 15m crosswalk. (B) Histogram of the extension of distance relative to a non-obstacle diagonal crossing.

Conclusions

At the junction of three major hospitals and many medical institutions, the BCH Intersection is a critical intersection for the Longwood community. We have found that:

- The BCH intersection has a shorter walk interval than sister intersections.
- The average walking speed for a healthy adult is insufficient to cross the BCH intersection (**Figure 3/4**).
- 97% of walkers crossing horizontally/vertically successfully crossed the BCH intersection, but only 46% of walkers successfully crossed diagonally (**Figure 5B, 6**).
- Obstacles in the middle of the intersection (cars, bikes) further exacerbate the time stress of the diagonal by around 15%, and up to 30% more distance/speed is required to cross in time (**Figure 8**).

This crosswalk is not solely used by "healthy adults." The proximity to BCH inherently suggests large pediatric and unwell populations who need to use this crosswalk. We do not believe that the crossing time accommodates all patients, practitioners, residents, and visitors of the Longwood Medical Area.

A Petition

We have generated a petition that we aim to present to the appropriate authorities about the light cycle, if you agree that—in the face of the evidence that we have presented—the BCH intersection walk time should be extended, please fill out the petition form.

SCAN ME

Acknowledgements

All code and raw data for this study is available at: github.com/Arnavlal/BCH_Crosswalk/. This study is anonymized, and no human subjects research was conducted; no IRB was solicited for this pilot study. All data was collected and analyzed by SRA and AL. We are grateful to the many med students who kept us company during the data collection process.

References:
1. Alves, F. et al. Walkability Index for Elderly Health: A Proposal. *Sustainability* 12, 7360 (2020).
2. Cavagna, G. A., Franzetti, P. & Fuchimoto, T. The mechanics of walking in children. *The Journal of Physiology* 343, 323–339 (1983).