

# Analysis of Five Field Event Performances at the Drake Relays by Age and Gender, 1978-2008

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We analyzed gender and age differences in Drake Relays performance distances for 2 jumping (long jump and triplejump) and 3 throwing (discus, javelin, shotput) field events for 31 years (1978-2008). The top 10 performances were taken each year for 4 groups: high school (HS) boys, HS girls, college/university (C/U) men, C/U women. Our data set included 4403 performances total, because not all ages/genders competed in all events or for the same number of years. Generally, females significantly improved their jumping or throwing distances whereas males showed no improvements or significantly declined in performance. HS girls showed statistically significant improvements in all 3 of their events (discus, javelin, long jump), and C/U women showed improvements in 4 of their 5 events (discus, javelin, shotput, triplejump) and demonstrated no change in long jump performance. In comparison, H/S boys showed no changes in 2 of their 3 events (discus and shotput) and significantly shorter distance in long jump, and C/U men demonstrated significantly shorter throwing or jumping distances in 4 of their 5 events (javelin, shotput, long jump, triplejump) and no change in discus. Despite the improvements in female performance distances, males threw or jumped further than females in all events for all years except for discus, where C/U women were out-throwing HS boys by 2008. As the Drake Relays includes athletes from across the country, these differences likely reflect national trends and are possibly explained by forces such as increased pressure for youth sport specialization, declining popularity of track-and-field, and Title IX.

## INTRODUCTION

- Relative improvement of athletic performance in recent years has been higher in women than in men, being nearly doubled across the different specialties (Lippi et al. 2008).
- Similar plateaus in running performance for men and women over the past 20 years reflect growing sex equality in sports participation (Cheuvront et al. 2005).
- The progression of world records (WR) in athletics is traditionally considered a reliable way to assess the improvement of athletic performances over the time from both physical and physiological perspectives, as WR's are measured in fairly standard external conditions (Lippi et al. 2008). The biggest increases were observed for javelin throw and shot put, in both men and women, respectively.
- One study suggested that uninterrupted career-span training plays a role in the maintenance of elite Masters' running performance even in the face of predicted age-related decline (Bradley et al. 2005). Research on aging and motor-behavioral performance has demonstrated that a decline is inevitable and oftentimes quite dramatic (Young and Starkes 2005).
- Another study showed performance in throwing and jumping field events declined linearly and more rapidly than in running events, though there was no statistically significant difference in rates of declining performance for any age groups between men and women (Baker et al. 2003). Women's average performance for each event was 82% to 91% of the men's performance (Baker et al. 2003).
- Compared with females, males are stronger and have greater aerobic capacity. Even when maximal oxygen uptake is expressed relative to lean body mass, men still retain an aerobic performance advantage (Lepers 2008).

## METHODS

Performance times were inputted manually into Microsoft Excel from both race results packets as well as *The Des Moines Register*. Professional (non-college-associated) athletes or athletes competing out of their age/school range were excluded from analysis. Not all ages/genders participate in all events, or for the full 31 years this study includes (see **Table 1**). Sometimes 10 performances were not available for a given event by age/gender. In total, we collected 4403 data points. Performances were often recorded in standard English units of measurement; all outcomes were converted to metric manually before analysis. Databases were inputted into Statistix v. 9 (Tallahassee, FL). Linear regression equations and p-values were determined for each event by age and gender separately.

Table 1

	HS Boys	HS Girls	C/U Men	C/U Women
Discus	1978 (31)	1992 (17)	1978 (31)	1979 (30)
Javelin			1978 (31)	1979 (30)
Shotput	1978 (31)	1992 (17)	1978 (31)	1978 (31)
Long Jump	1978 (31)	1992 (17)	1978 (31)	1978 (31)
Triplejump			1978 (31)	1985 (24)

Table 2

	HS Boys	HS Girls	C/U Men	C/U Women
Discus	$y=3.5163+0.0221x$ $p=0.238$ Steady	$y=-212.27+0.1253x$ $p=0.003$ Farther	$y=100.30-0.0235x$ $p=0.198$ Steady	$y=-311.56+0.1802x$ $p<0.001$ Farther
Javelin			$y=320.81-0.1286x$ $p<0.001$ Shorter	$y=-367.68+0.2069x$ $p<0.001$ Farther
Shotput	$y=14.101+0.0011x$ $p=0.8243$ Steady	$y=-35.435+0.0238x$ $p=0.023$ Farther	$y=49.694-0.0161x$ $p=0.009$ Shorter	$y=-89.334+0.0522x$ $p<0.001$ Farther
Long Jump	$y=15.681-0.0046x$ $p=0.002$ Shorter	$y=-6.2856+0.0058x$ $p=0.079$ Farther(t)	$y=15.124-0.0038x$ $p=0.015$ Shorter	$y=0.4359+0.0028x$ $p=0.138$ Steady
Triplejump			$y=26.353-0.0055x$ $p=0.096$ Shorter(t)	$y=-48.623+0.0305x$ $p<0.001$ Farther

Fig. 1

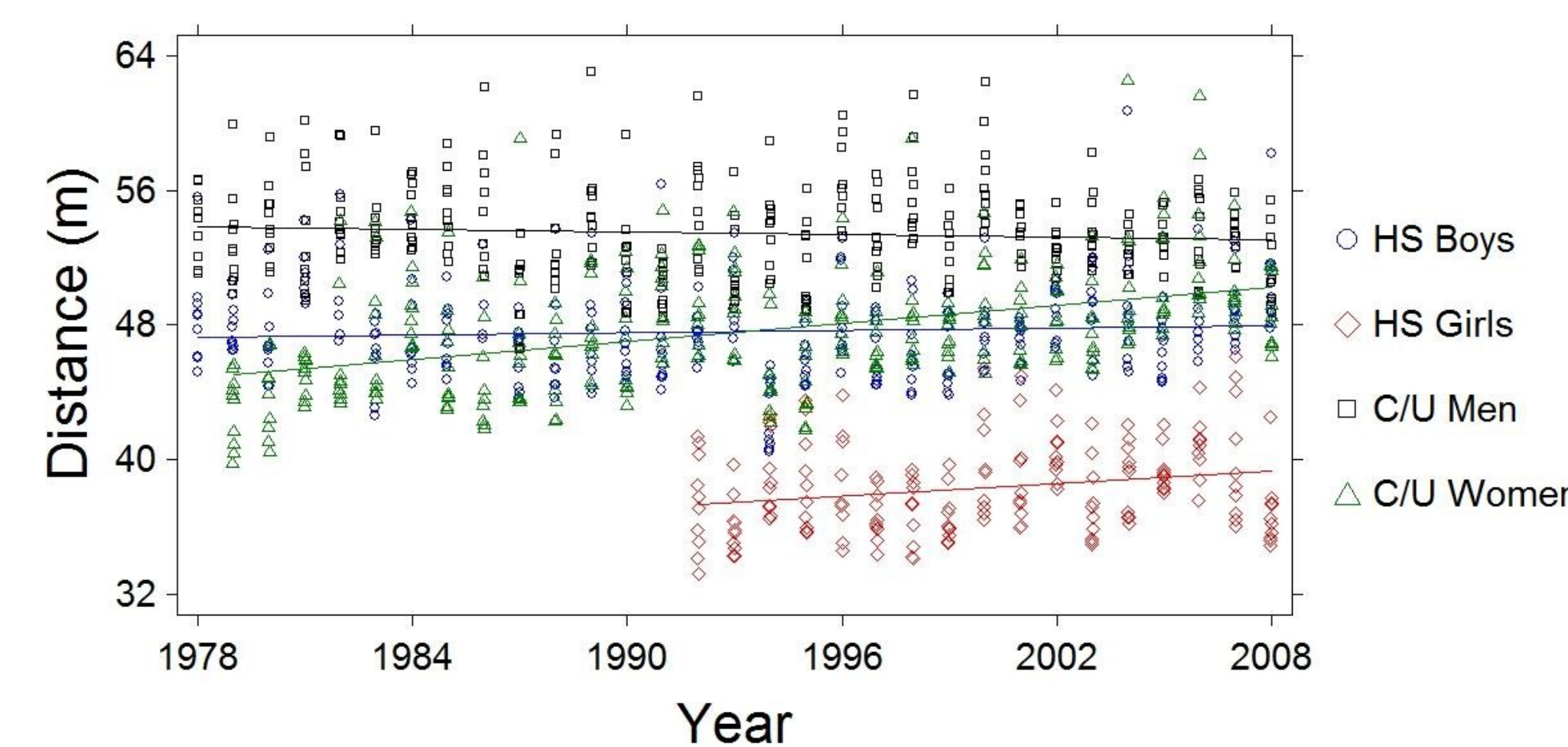


Fig. 2

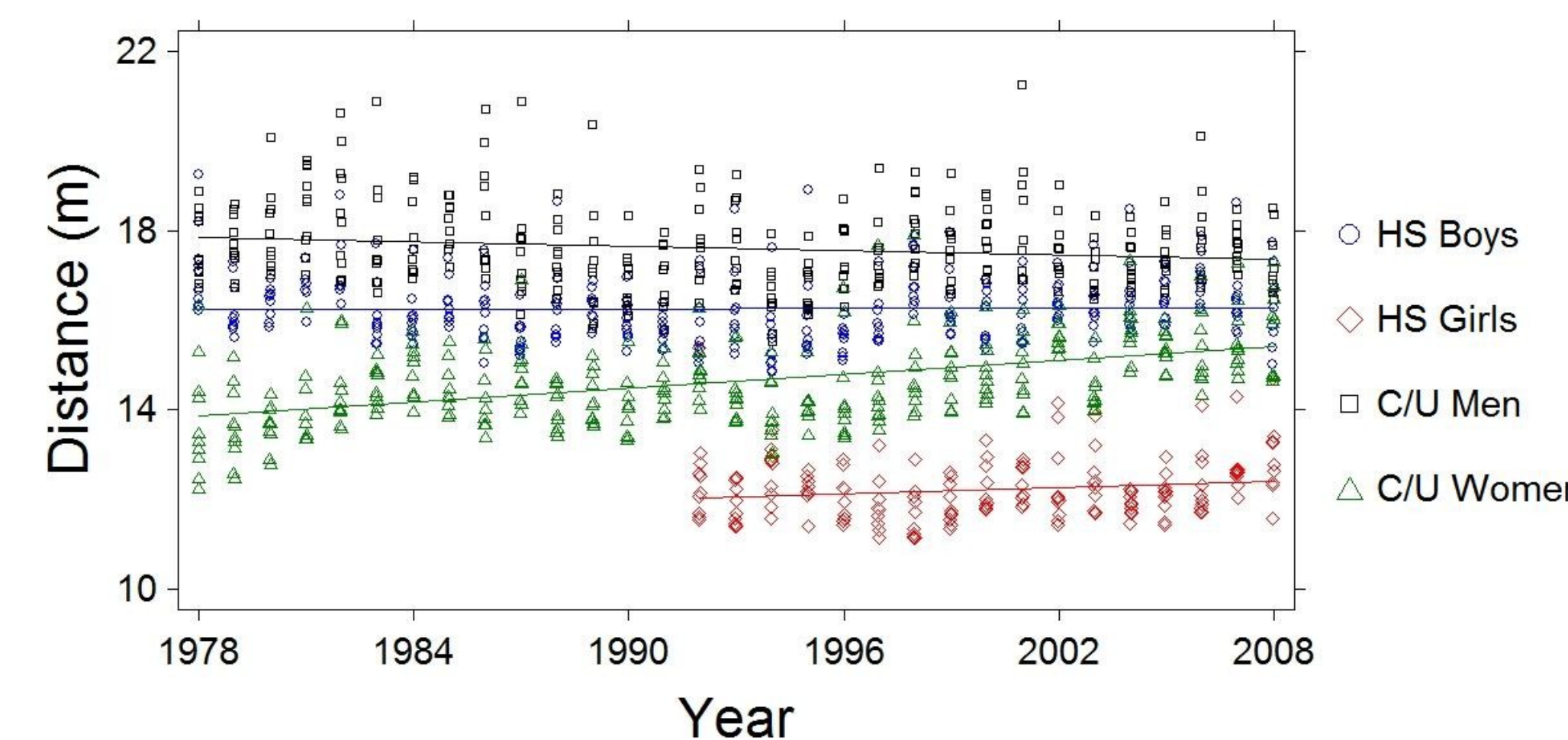
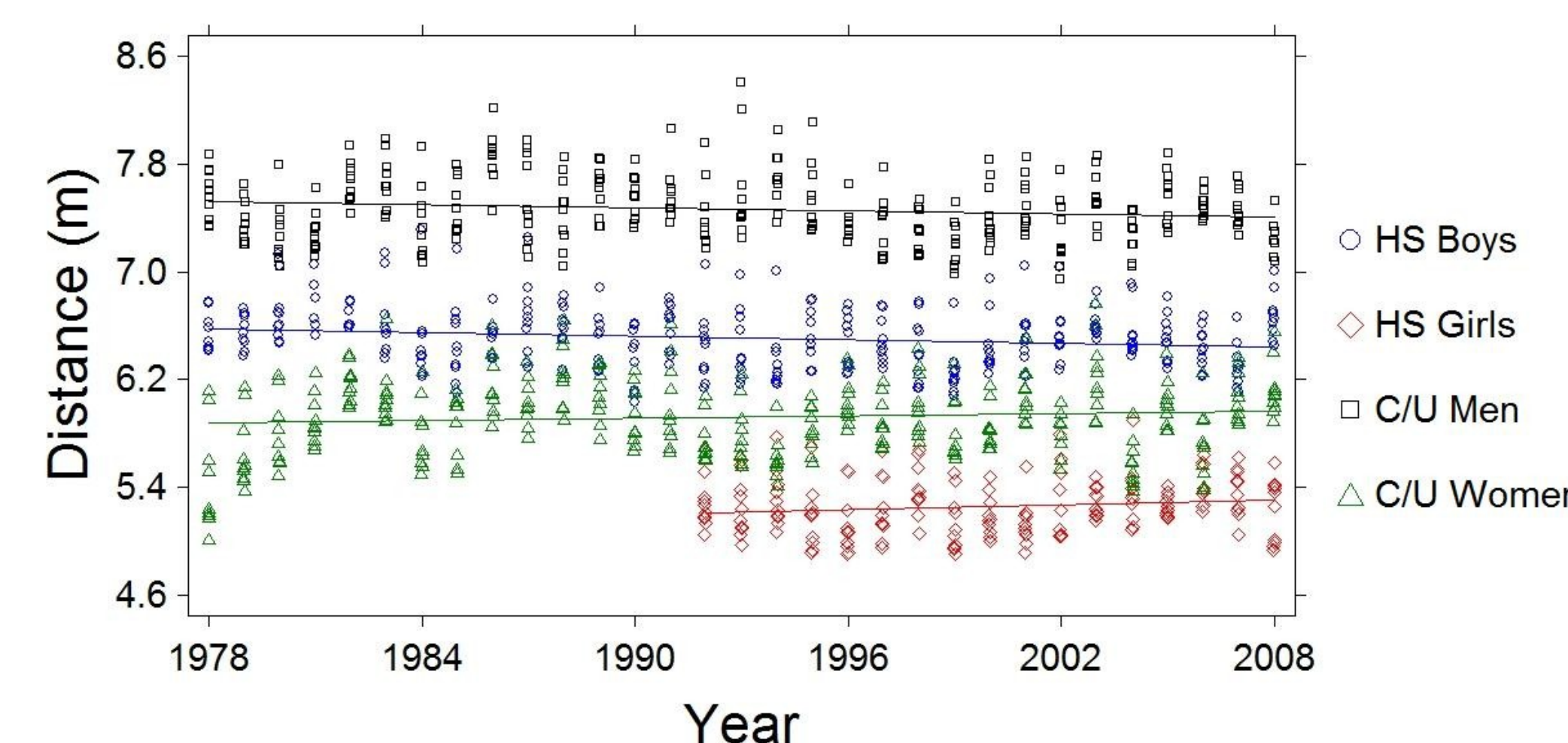


Fig. 3



## RESULTS

- **Table 2: Linear regression equations for each event by age and gender.** P-values indicate significance (significance defined as  $p \leq 0.05$ ; trend defined as  $0.05 \leq p \leq 0.10$ ). When a change was significant, a qualifier such as "faster," "steady," or "slower" is given, respectively; a "t" in parentheses indicates a trend towards significance. For field events, a greater distance indicates an improvement in performance.
- **Figure 1: Discus performance.** Both high school girls and college/university women showed an improvement in performance (farther, both  $p \leq 0.003$ ) whereas both high school boys and college/university men showed no change in improvement ( $p=0.238$  and  $0.198$ , respectively).
- **Figure 2: Shotput performance.** Both high school girls and college/university women showed an improvement in performance (farther,  $p=0.023$  and  $p<0.001$  respectively) whereas high school boys were steady in performance ( $p=0.8243$ ). Men showed a decline in performance (shorter,  $p=0.009$ ). A similar pattern was observed in javelin and triple jump.
- **Figure 3: Javelin Performance.** College/university women showed an improvement in performance (farther,  $p<0.001$ ) whereas college/university men showed a decline in performance (shorter,  $p<0.001$ ).

## DISCUSSION

- College/university athletes performed better than high school athletes in all events overall within their respective genders.
- Though males performed better than females in terms of absolute distances thrown or jumped, females demonstrated significant improvements in performance for most events whereas males demonstrated no change or significant declines in performance for most events.
- Differences likely reflect national trends and are possibly explained by forces such as increased pressure for youth sport specialization, declining popularity of track-and-field, and Title IX.

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