The University of Toronto

Racial Disparities in Age at Arrest: An Analysis of Police Records by Perceived Race, Sex, and Arrest Data

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Colab Link

Introduction

Arrest data is a critical source of information for understanding the prevalence of criminal behavior and its impact on society. In recent years, there has been growing concern about the disproportionate representation of particular demographic groups, such as minorities and young people, in the criminal justice system. This has led to a renewed focus on factors contributing to criminal involvement, including age, race, and sex.

In this study, we conducted an exploratory data analysis (EDA) and statistical tests to examine the relationship between age at arrests and strip searches in a dataset of police records. Specifically, we were interested in investigating whether there were any differences in the counts of strip searches among different racial groups, sexes, ages, and cooperative attitudes at the time of the arrest. We first performed an EDA to explore the general data distribution and identify potential issues needing attention. Then, we conducted t-tests and ANOVA to examine the differences between groups and identify any significant factors that could impact the likelihood of strip searches during or after an arrest. By combining these analytical methods, we aimed to provide a comprehensive understanding of the arrest and strip search data and shed light on potential areas for further research and policy improvements. Specifically, we will explore the following research questions:

1. Is there any significant difference in age between combative individuals and those not during an arrest?
2. Is there significant differences in age at which individuals of different races are subjected to strip searches during an arrest?
3. Are there any statistically significant differences in the mean age of arrest between different groups defined by sex and race?

Literature Review

In this literature review, we explore three research questions related to the age at arrest and strip searches during police arrests. The first question asks whether there is a significant difference in the age at arrest between combative individuals and those who were not during an arrest. The second question examines whether there are significant differences in the age at which individuals of different races are subjected to strip searches during an arrest. Finally, the third question explores whether there are statistically

significant differences in the mean age of arrest between different groups defined by sex and race. These questions are essential because they address issues of fairness and potential biases in the criminal justice system and could help identify areas where reform is needed.

Despite the significance of age in criminal involvement, research has shown variation in the age-crime relationship across historical periods, societies, crime types, and groups. The patterns of criminal involvement in the life course are also influenced by several social factors, such as race, gender, and socioeconomic status. Ulmer and Steffensmeier (2014) proposed that physical development and aging only partially explain the association between age and criminal involvement. Physical abilities, such as strength, speed, prowess, stamina, and aggression, are helpful for many crimes. Still, the declining physical strength and energy that come with age can make criminal activity more dangerous and unsuccessful. While biological and physiological factors can help explain the rapid increase in adolescent delinquent behavior, they cannot fully account for the decline in the age-crime curve following mid to late adolescence. Furthermore, social processes associated with industrialization and the postindustrial age have exacerbated the stresses of adolescence and contributed to increased levels of juvenile criminality in recent decades. The relationship between age at arrest and behavior during the arrest, such as aggression or non-compliance, is an area that merits further exploration in the literature. Based on this literature review, it may be suggested that there is no significant difference in the age at arrest between combative and non-combative individuals, as physical development alone cannot fully explain the age-crime curve.

Using strip searches during arrests has been controversial, with concerns about its potential for discriminatory treatment. Research has shown that strip-search powers are used disproportionately against Afro-Caribbean arrestees, even after controlling for factors like sex, age, the reason for arrest, and charge (Keeton, 2015). In addition, Latinos are more likely to be subjected to strip searches during police stops if officers do not take extra steps to confirm the validity of systems reporting the names of illegal immigrants, as false positives are more likely to be triggered by Hispanic last names. It is not only adults who are subjected to discriminatory strip searches. Black and Latino schoolchildren are also often subjected to arbitrary discipline. Studies have found that these minority groups are more likely to be referred to the police for infractions, arrested, and suspended than their

White counterparts. Furthermore, research shows that the age at which individuals of different races are subjected to strip searches also varies. For instance, the author found that Black and Latino arrestees were more likely to be strip-searched younger than their White counterparts, reflecting a disparate impact of strip-search practices in the age of colorblind racism.

Additionally, according to a study by Newburn, Shiner, and Hayman (2004), male arrestees were almost twice as likely to be strip-searched as female arrestees. Age was also a factor, with the rate of strip searches declining as age increased, particularly among adult arrestees. Juveniles had a relatively low rate of strip-search, which could be due to protective legislation. The study also found that ethnicity played a more significant role in the outcomes of an arrest than either sex or age. African-Caribbean arrestees were the most likely to be charged and less likely to receive a caution, reprimand, or warning, while white arrestees were the most likely to receive these outcomes. The study noted that receiving official action other than a charge, caution, reprimand, or warning was associated with a particularly low rate of strip searches. Among ethnic groups, Arabs had a relatively high rate of strip searches, with Asian and Mediterranean groups having lower rates.

The relationship between mean age at arrest and race and sex has interested researchers studying criminal justice. One study examined the over-representation of Black people in single charge cases in Toronto (Chan & Chunn, 2017). Despite making up only 8.8% of the population, Black people represented 28.8% of the cases in the dataset, making them 3.3 times more likely to appear in single charge cases than their representation in the general population would predict. Further data analysis revealed that Black males have much higher charge rates than males from all other racial groups within each offense category. Black males represent only 4% of Toronto's population but are involved in almost a third of the charges captured by the data request. This means that Black males are 7.3 times more likely to appear in the charge dataset than their representation in the general population would predict.

In terms of overall charge rates conducted by the same study, the rate for Black males (29,694 per 100,000) is 4.5 times higher than the rate for White males (6,673 per 100,000) and 7.5 times higher than the rate for males from other racial minority backgrounds (3,935 per 100,000). The rate for Black women (2,805 per 100,000) is 2.4 times higher than the rate for White women (1,159 per 100,000) and 6.2 times higher than

the rate for women from other racial minority groups (454 per 100,000) (Chan & Chunn, 2017). It is important to note that Black racial identity still increases the likelihood of arrest after controlling for frequency and seriousness of the offending, gender, age, socioeconomic status, family characteristics, and other risk factors.

Exploratory Data Analysis

After performing various data cleaning processes on the arresting dataset and identifying key research questions, we narrowed our focus to specific patterns and variables, including race perceived at arrest, sex, occurrence, age, and actions at arrest, strip search, and items found. To further support our analysis, we conducted exploratory data analysis to identify correlations and connections between the variables. We hope to understand better the underlying factors contributing to arrest and criminal involvement patterns by delving deeper into the data and uncovering meaningful insights.

We observed specific patterns in the different categorical groups during our analysis of the arrest counts. Figure 1 depicts the counts of arrests among seven racial groups, where White had the highest number of arrests followed by Black, while Latino and Indigenous had the lowest.

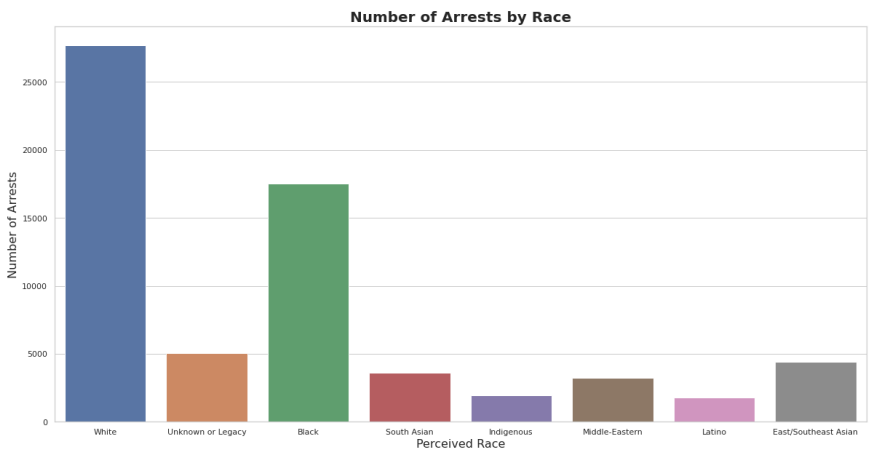

Figure 1: Number of Arrested by Race

To further understand these patterns, we performed an additional analysis which included sex, month, and age at arrest, as illustrated in Figure 2. Despite the similarity in the month of arrests, a clear correlation was observed between sex and age at arrest. The data revealed that males constituted around 80% of the total arrest counts, with over 50,000 records. Interestingly, most arrests occurred among individuals in their late 20s and

early 30s, which aligns with our literature research on the relationship between physical abilities and criminal involvement.

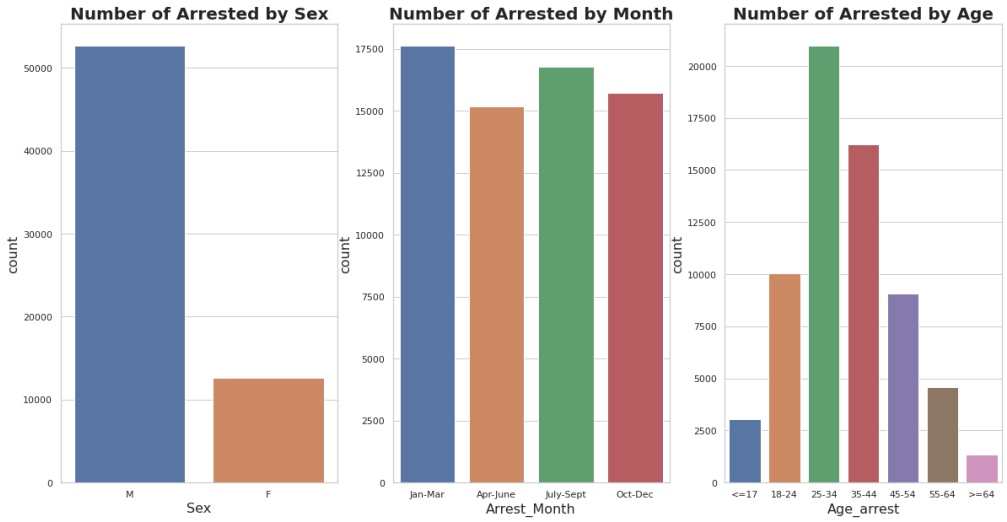

Figure 2: Number of Arrested by Sex, Month, and Age

In our research question, we were interested in understanding more about the arrest and strip search data. We first examined the differences in the counts of arrests among racial groups and wanted to see if a similar trend was present regarding the counts of strip searches. As shown in Figure 3, police officers conducted most of the strip searches on White and Black arrestees. However, when we compared the number of strip searches performed on these two groups with the number of arrests, we found that the proportion of strip-searched White arrestees was much lower than that of Black arrestees. In other words, Black arrestees were more likely to be strip-searched by police officers than White arrestees.

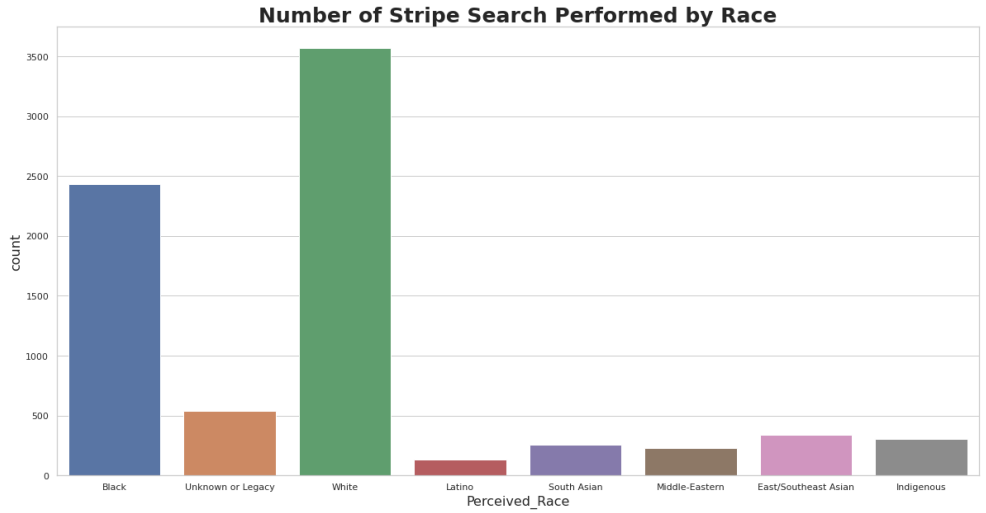

Figure 3: Number of Strips Search by Race

Furthermore, since we observed a difference in the number of arrests by sex and age, we performed additional visualizations using strip search data, as shown in Figure 4. Our analysis revealed that not only sex but also the age at the time of arrest showed a similar trend regarding strip searches. This suggests that age and sex did not have a significant impact on the decision-making of police officers regarding strip searches. These findings suggest that the likelihood of being strip-searched by police officers may vary based on racial identity and that Black arrestees may be subject to strip searches at a higher rate than their White counterparts.

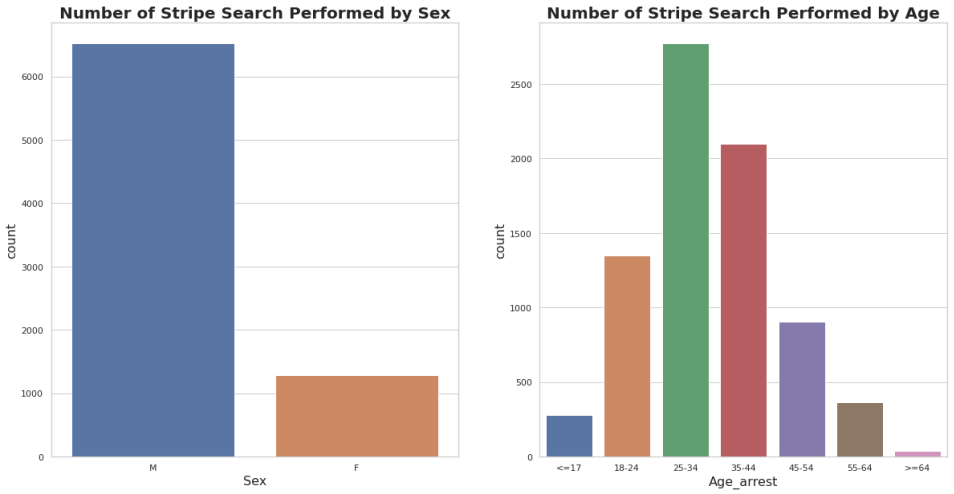

Figure 4: Number of Strip Search by Sex and Age

Figures 5 and 6 show that cooperative action at arrest took up the most significant portion of the data, with counts of almost 30,000. However, despite the lack of resistance or aggression, around 3,000 of these cooperative arrests still resulted in strip searches, which accounts for approximately 10% of the total arrests in the same action. This finding suggests that the actions at arrest may not be the primary factor in determining whether an individual will be subject to a strip search. These results align with previous studies on the subject, which have indicated that strip searches are often carried out based on various factors, including the discretion of individual officers, the policies and procedures of the law enforcement agency, and the circumstances of the arrest. Therefore, further research is needed to understand better the factors influencing the decision to perform a strip search

and to develop more consistent and equitable policies and procedures surrounding this controversial practice.

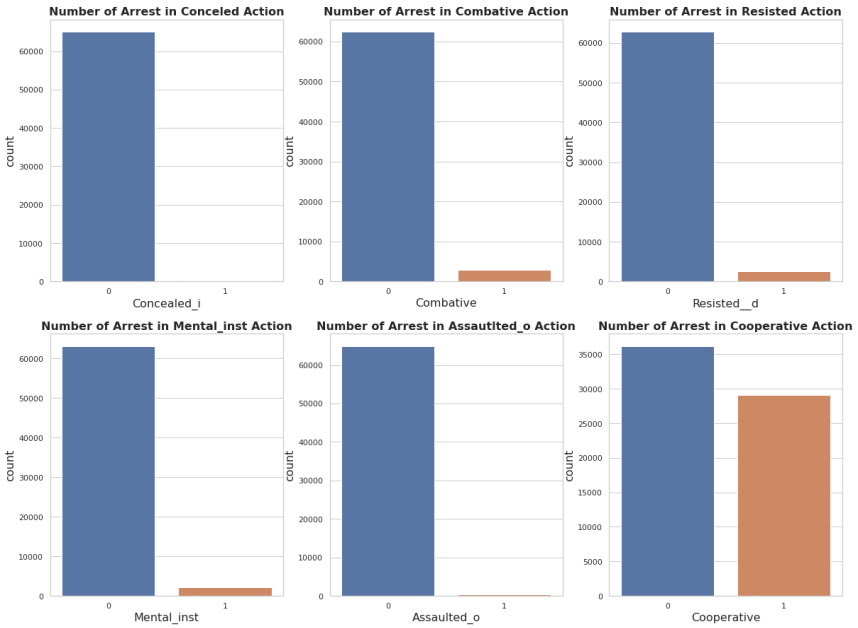

Figure 5: Counts of Arrest by Action

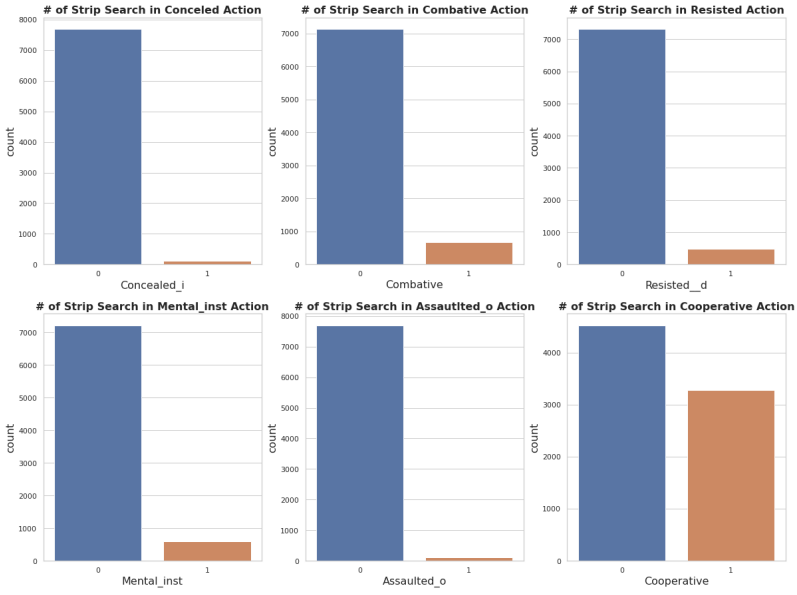

Figure 6: Counts of Strip Search by Action

Before proceeding with the statistical test, we examined the general distribution of the data to identify any significant variables that require attention. Figures 7 and 8

show a similar distribution of arrest data in sex, age, and race, which may suggest that police officers are making arrests based on the crime committed rather than the individual's demographics. In other words, the officers are not biased toward a particular gender, age group, or racial group when making arrests. However, this does not necessarily mean that there is no bias present in the criminal justice system. Other factors may contribute to the disparities in the criminal justice system, such as the over-policing of specific neighborhoods or the differential treatment of certain crimes. Therefore, it is essential to consider multiple factors and conduct further analysis to understand the underlying causes of the observed patterns.

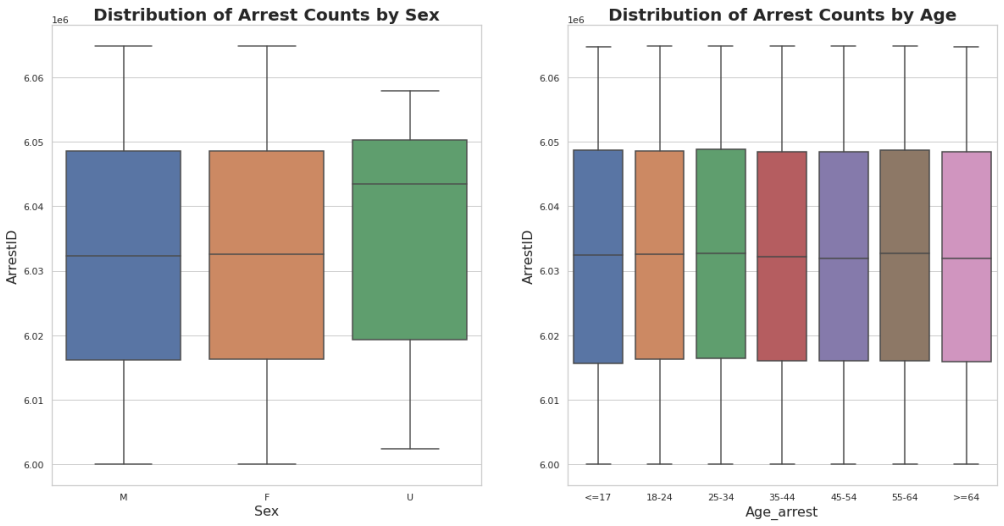

Figure 7: Distribution of Arrest by Sex and Age

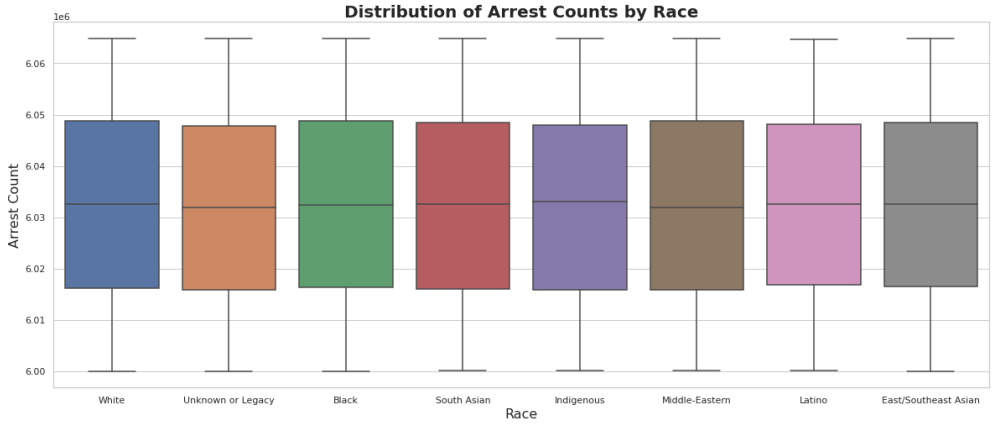

Figure 8: Distribution of Arrest by Race

T-tests

T-tests are deployed to test the hypotheses of means of a dependent variable depending upon the different levels of a categorical variable. They are handy in checking whether a change in the level of a categorical variable influences the continuous dependent variable. The only limitation is that a single t-test can only check the difference between two levels at a time – something that ANOVA overcomes.

Welch's t-test is the most robust t-test. It assumes unequal variances between the groups it is being tested on. And when the variances are equal, the results are the same as those of the Student t-test with equal variances. That is why we exclusively ran Welch's t-tests. We used two-tailed t-tests only because we had no hypothesis about the direction of the difference.

Additionally, there were two assumptions to test for before running a t-test: homogeneity of variances and normality. The first assumption is considered false since we're using Welch's t-test. We ran a Shapiro test to check for normality, but all of our variables had more than 5000 rows, making the p-value inaccurate. Additionally, all of our variables had significant results on the Shapiro test, i.e., we rejected the null hypothesis that the distribution was normal for arrest age and variables we discuss below. Regardless of this limitation, we moved forward with our t-tests.

We considered the t-tests somewhat part of our EDA and, as such, executed a lot of them. A select few relevant to our research questions are presented below, along with their interpretations.

Test 1: Sex and Arrest Age

Null Hypothesis: there is no difference in the mean arrest age of males and females
Alternative Hypothesis: there is a difference in the mean arrest age of males and females

Our results gave a p-value < 0.05, indicating significant results hence we reject the null that there are no differences in mean arrest age of males and females. The mean arrest age for males was 36.36, with a standard deviation of 12.39 years. The mean arrest age for females was 34.95, with a standard deviation of 11.94 years. We are 95% confident that the difference in the means is between 1.18 and 1.64 years.

More analysis could be possible if we compare each gender with each other – more on this in the ANOVA section.

Test 2: Race and Arrest Age

Null Hypothesis: there is no difference in the mean arrest age of white and black individuals
Alternative Hypothesis: there is a difference in the mean arrest age of white and black individuals

Our results gave a p-value < 0.05, indicating significant results hence we reject the null that there are no differences in mean arrest age of white and black people. The mean arrest age for a white person was 38.65, with a standard deviation of 12.29 years. The mean arrest age for females was 32.48, with a standard deviation of 11.29 years. We are 95% confident that the difference in the means is between 5.94 and 6.38 years.

We ran more similar tests comparing means of white to south Asians, white and indigenous. The results aren't presented here because we do a deep dive into them in the ANOVA section.

Test 3: Strip search and Arrest Age

Null Hypothesis: there is no difference in the mean arrest age of people who were strip-searched and those who were not
Null Hypothesis: there is a difference in the mean arrest age of people who were strip-searched, and those who were not

Our results gave a p-value < 0.05 indicating significant results hence we reject the null that there are no differences in mean arrest age of people who were strip searched and those who were not. The mean arrest age for strip-searched individuals was 34.54, with a standard deviation of 10.96 years. The mean arrest age for those not strip searched was 36.30, with a standard deviation of 12.47 years. We are 95% confident that the difference is between 1.50 and 2.03 years.

Test 4: Combative and Arrest Age

Null Hypothesis: there is no difference in mean arrest age between combative individuals and those who were not

Alternative Hypothesis: there is a difference in mean arrest age between combative individuals and those who were not

Our results gave a p-value > 0.05 indicating insignificant results hence we accept the null that there are no differences in mean arrest age between combative individuals and those who were not. The mean arrest age for combative individuals was 36.25 years, with a standard deviation of 11.37. The mean arrest age for non-combative individuals was 36.08 years, with a standard deviation of 12.36. We are 95% confident that the difference is between -0.59 and 0.26 years. Note the negative result is from the fact the mean arrest age of non-combative individuals is smaller than that of combative individuals.

This result seems to answer our research question but we will further investigate this in ANOVAs. The next two t-tests are also indicative of why we need two-way ANOVAs: t-tests can look into differences at multiple levels of two categorical variables.

Test 5: Females, Strip search, and Arrest Age

Null Hypothesis: there is no difference in the mean arrest age of females who are strip searched and those who are not.

Alternative Hypothesis: there is a difference in the mean arrest age of females who are strip searched and those who are not.

Our results gave a p-value < 0.05, indicating significant results hence we reject the null that there are no differences in the mean arrest age of females who are strip searched and those who are not. The mean arrest age for females who are not strip searched is 35.08, with a standard deviation of 12.15 years. The mean arrest age for females who are strip searched is 33.80, with a standard deviation of 9.88 years. We are 95% confident that the difference in mean age is between 0.69 and 1.86 years.

Test 6: Black, Gender, and Arrest Age

Null Hypothesis: there is no difference in the mean arrest age of black males and females
Alternative Hypothesis: there is a difference in the mean arrest age of black males and females

Our results gave a p-value < 0.05 indicating significant results hence we reject the null that there are no differences in mean arrest age of black males and females. The mean arrest age for black males is 32.75, with a standard deviation of 11.34 years, while the mean arrest age for black females is 31.20, with a standard deviation of 10.94 years. We are 95% confident that the difference is between 1.12 and 1.97 years.

In summary, all these t-tests did allude to what the answers to our research questions will be. Still, as noted earlier, t-tests can only examine the difference of means between two categorical variable groups. It cannot look at the difference of means of various levels of a categorical variable or assess the interaction of two categorical variables. As a result, we move on to ANOVAs for a comprehensive answer to our research questions.

Methods

The dataset used in this study includes information related to all arrests and strip searches in the City of Toronto. The data is provided by the Toronto Police Service and can be accessed through the following link:

Toronto Police Service. 2021. Arrests and Strip Searches (RBDC-ARR-TBL-001). [Dataset]. Toronto Police Service. https://doi.org/10.21232/TorontoPS-arrests-and-strip-searches-rbdc-arr-tbl-001

The dataset includes 25 variables such as the age of the person arrested, their perceived race, sex, location of the arrest, and whether or not the person was strip-searched. 37,347 arrestees were recorded in the dataset, with a total of 64,805 arrest records. Most variables have binary values, such as Stripsearch, Actions at arrest, search reason, and items found. Strip searches, as one of the binary values, involve the removal of some or all clothing and a visual inspection of the body, which is represented as either 1 or 0. Categorical variables include arrest year, month, perceived race, sex, age group, location, and occurrence. There are 8 racial and 7 age groups perceived in the data separated into

male, female, or undefined. It is also worth noting that there are 469 null values under Arrest ID.

After thoroughly exploring the EDA section, we used one-way and two-way ANOVAs to look at our multilevel categorical variables. They helped us in examining our research questions. The

Results

i. One-way ANOVA

Some of our dependent variables had more than two levels. This made it difficult to do t-tests repetitively. As a result, we tried to use one-way ANOVAs. We applied them to two variables, *Sex,* and *Perceived Race.* Our dependent variable is arrest age. All other variables had two levels only and as a result, t-tests would suffice in those cases. The hypotheses are below,

Sex

Null Hypothesis: There is no difference in means for the categories in Sex
Alternative Hypothesis: There is a difference in means for the categories in Sex

Perceived Race

Null Hypothesis: There is no difference in means for the categories in Perceived Race
Alternative Hypothesis: There is a difference in means for the categories in Perceived Race

Both of our one-way ANOVAs from Figure 9 indicates that they were statistically significant: we reject the null hypothesis that the means of the levels of the categorical variables are the same (for both variables)

Variable	F-statistic	p-value	Reject null?
Sex	67.18	0.00	Yes
Perceived Race	420.75	0.00	Yes

Figure 9: Summary of results of our One-way ANOVAs

After running these ANOVAs, we ran a posthoc test: Tukey HSD. This allows us to see the difference between means among the various levels of our categorical variable. A summary of the results is presented below.

1. **Sex**

We ran a one-way ANOVA on Sex and Arrest age to see if there were any differences in the means for the various genders. The results are below,

Group 1	Group 2	Mean Diff	P-value	Lower	Upper	Reject
F	M	1.41	0.001	1.12	1.70	True
F	U	0.82	0.9	-8.79	10.44	False
M	U	-0.59	0.9	-10.20	9.02	False

Figure 10: Tukey HSD results of Sex and Arrest age

In Figure 10, we see that at a confidence level of 95% and interval of [1.12, 1.70], the mean age of males is larger than that of females by 1.41 years. It indicates that females are getting arrested at a younger age than males. The results for the other two levels turned out to be significant, as their p-values were greater than 0.05.

2. **Perceived Race**

There were, in total, 7 races in the dataset. After a significant ANOVA, we ran a Tukey HSD test which took a closer look at the difference in means. The results are below,

Multiple Comparison of Means - Tukey HSD, FWER=0.05						
group1	group2	meandiff	p-adj	lower	upper	reject
Black	East/Southeast Asian	4.2524	0.001	3.6371	4.8677	TRUE
Black	Indigenous	3.848	0.001	2.9724	4.7237	TRUE
Black	Latino	2.2524	0.001	1.3409	3.1639	TRUE
Black	Middle-Eastern	1.5945	0.001	0.8957	2.2933	TRUE
Black	South Asian	3.4216	0.001	2.7541	4.089	TRUE
Black	Unknown or Legacy	3.3573	0.001	2.7741	3.9405	TRUE
Black	White	6.1633	0.001	5.8107	6.5159	TRUE
East/Southeast Asian	Indigenous	-0.4044	0.9	-1.4009	0.5921	FALSE
East/Southeast Asian	Latino	-2	0.001	-3.0281	-0.9718	TRUE
East/Southeast Asian	Middle-Eastern	-2.6579	0.001	-3.5033	-1.8126	TRUE
East/Southeast Asian	South Asian	-0.8309	0.0442	-1.6504	-0.0113	TRUE
East/Southeast Asian	Unknown or Legacy	-0.8951	0.0075	-1.6477	-0.1425	TRUE
East/Southeast Asian	White	1.9109	0.001	1.3188	2.503	TRUE
Indigenous	Latino	-1.5956	0.0015	-2.7978	-0.3934	TRUE
Indigenous	Middle-Eastern	-2.2535	0.001	-3.3037	-1.2034	TRUE
Indigenous	South Asian	-0.4265	0.9	-1.456	0.603	FALSE
Indigenous	Unknown or Legacy	-0.4907	0.7693	-1.4677	0.4863	FALSE
Indigenous	White	2.3153	0.001	1.4558	3.1748	TRUE
Latino	Middle-Eastern	-0.658	0.5757	-1.7382	0.4223	FALSE
Latino	South Asian	1.1691	0.0189	0.109	2.2293	TRUE
Latino	Unknown or Legacy	1.1049	0.0204	0.0956	2.1141	TRUE
Latino	White	3.9109	0.001	3.0149	4.8069	TRUE
Middle-Eastern	South Asian	1.8271	0.001	0.9431	2.7111	TRUE
Middle-Eastern	Unknown or Legacy	1.7628	0.001	0.9406	2.5851	TRUE
Middle-Eastern	White	4.5688	0.001	3.8904	5.2473	TRUE
South Asian	Unknown or Legacy	-0.0642	0.9	-0.86	0.7315	FALSE
South Asian	White	2.7418	0.001	2.0957	3.3879	TRUE
Unknown or Legacy	White	2.806	0.001	2.2473	3.3646	TRUE

Figure 11: Tukey HSD results for Perceived Race and Arrest age

There was a lot to unpack here in Figure 11. We will only look at the remarkable differences chosen based on size. With a confidence level of 95%, the following results have a p-value that is less than 0.05. The difference along with their confidence intervals are

- Arrest age of White individuals and Black individuals differ by 6.1 years [5.81, 6.51]
- Arrest age of White individuals and Middle-Eastern individuals differ by 4.5 years [3.89, 5.24]
- Arrest age of Black individuals and East/Southeast individuals differ by 4.2 years [3.63, 4.86]
- Arrest age of White individuals and Latino individuals differ by 3.9 years [3.01, 4.80]

ii. Two-way ANOVA

Some of our research questions required that we explore the effect of a combination of our categorical predictor variables on our continuous dependent variable. For this, we explored the combinations of variables described below.

1. Perceived Race and Combative

To address our first research question, we ran a two-way ANOVA between Perceived Race and Combative. The results are in Figure 12 below,

	sum_sq	df	F	PR(>F)
C(Combative)	8.14e+01	1	0.56	0.45
C(Percieved_Race)	4.27e+05	7	420.74	0.00
C(Combative):C(Percieved_Race)	7.62e+02	7	0.74	0.62
Residual	9.47e+06	65232	NaN	NaN

Figure 12: Results of Two-way ANOVA of Perceived Race and Combative

Only Perceived Race was a statistically significant predictor of arrest age. Neither Combative nor the interaction between Combative and Perceived Race has any statistically significant predictive power on arrest age. This aligns with our t-test result above. We can confirm this by viewing the interaction plot in Figure 13 below. There is no clear pattern or trend to notice here.

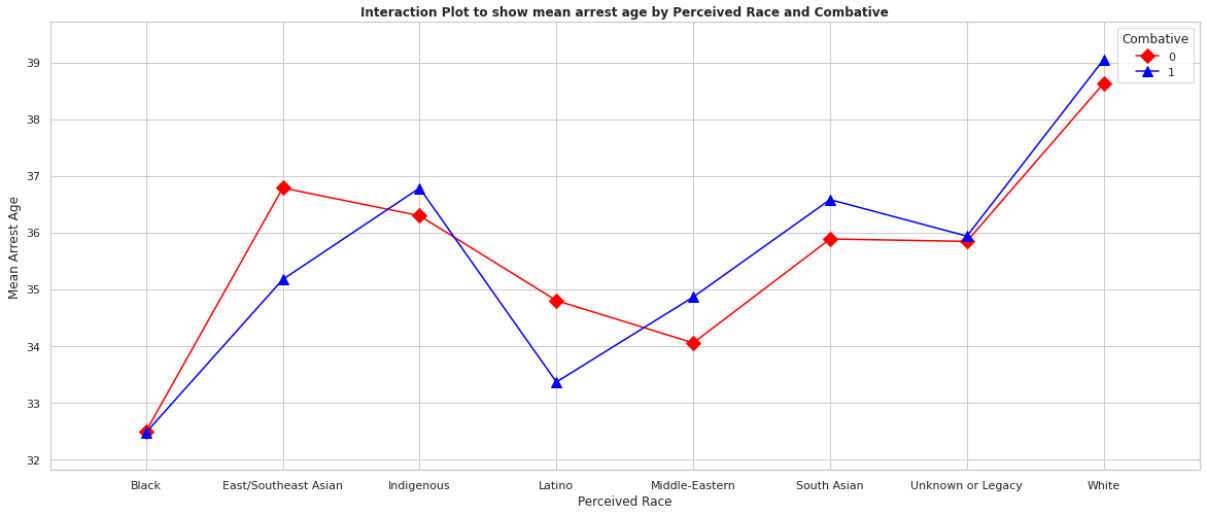

Figure 13: Interaction Plot to show mean arrest age by Perceived Race and Combative

2. Perceived Race and Strip Search

In Figure 14 below, we can see that Strip Search and Perceived Race both have a statistically significant (p-value less than 0.05) on the Arrest age of an individual. The interaction variable between Perceived Race and Strip Search is statistically insignificant with a p-value of 0.13.

	sum_sq	df	F	PR(>F)
C(Percieved_Race)	4.27e+05	7	421.11	0.00
C(StripSearch)	2.08e+04	1	144.06	3.72e-33
C(Percieved_Race): C(StripSearch)	1.60e+03	7	1.58	1.35e-01
Residual	9.45e+06	65232	NaN	NaN

Figure 14: Results of Two-way ANOVA of Perceived Race and Strip Search

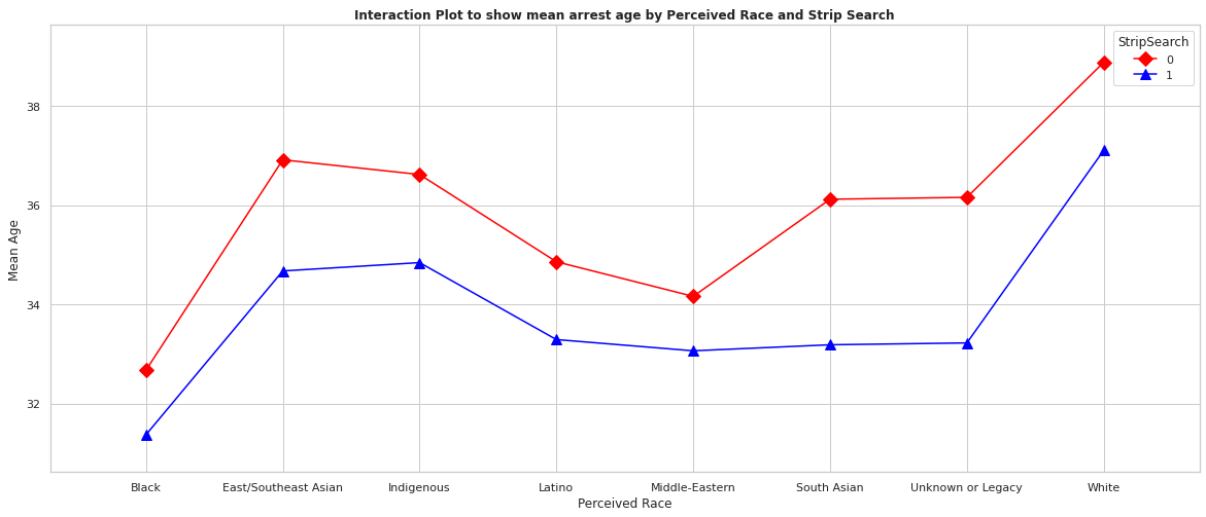

Figure 15: Interaction Plot to show mean arrest age by Perceived Race and Strip Search

We can see from Figure 15 above, that (a) the mean arrest age is lower for people who are strip searched across all races (b) the mean arrest age for black individuals is the lowest (c) the mean arrest age for white individuals is the highest. After this plot, we were curious to see if there were any such trends in individuals who were strip searched and an item was found.

3. Perceived Race and Item Found

From Figure 16 we see that Item Found and Perceived Race and statistically significant variables in predicting mean arrest age. The interaction of Item Found and Perceived Race is statistically significant as well.

	sum_sq	df	F	PR(>F)
C(ItemsFound)	1039.28	1	9.15	2.49e-03
C(Percieved_Race)	50047.35	7	62.95	1.55e-88
C(ItemsFound): C(Percieved_Race)	2368.89	7	2.98	4.01e-03
Residual	883945	7784	NaN	NaN

Figure 16: Results of Two-way ANOVA of Perceived Race and Item Found

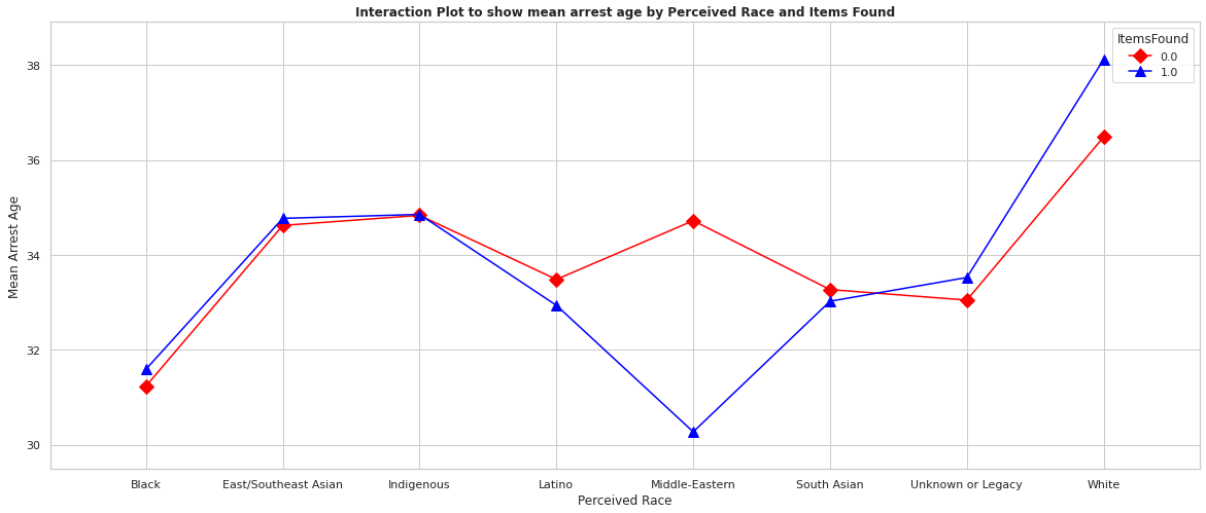

Figure 17: Interaction Plot to show mean arrest age by Perceived Race and Items Found

Looking at Figure 17 there doesn't seem to be anything extraordinary except that (a) the arrest age of individuals remains similar regardless of whether an item was found in a strip search (b) Middle-Eastern individuals have a stark contrast: those who were carrying a suspicious item were of a much younger age.

4. Sex and Perceived Race

Lastly, to address our third research question, we ran a two-way ANOVA on Perceived Race and Sex. From Figure 18 below we can see that both Sex and Perceived Race are significant

variables (p-value < 0.05) in predicting arrest age. The interaction of Sex and Perceived Race is a significant variable too. As always, this was followed up by an interaction plot as shown in Figure 19

	sum_sq	df	F	PR(>F)
C(Sex)	1.68e+04	2	58.07	6.32e-26
C(Percieved_Race)	8.62e+05	7	851.82	0.00
C(Percieved_Race): C(Sex)	7.04e+03	14	3.48	1.35e-04
Residual	9.43e+06	65229	NaN	NaN

Figure 18: Results of Two-way ANOVA of Sex and Perceived Race

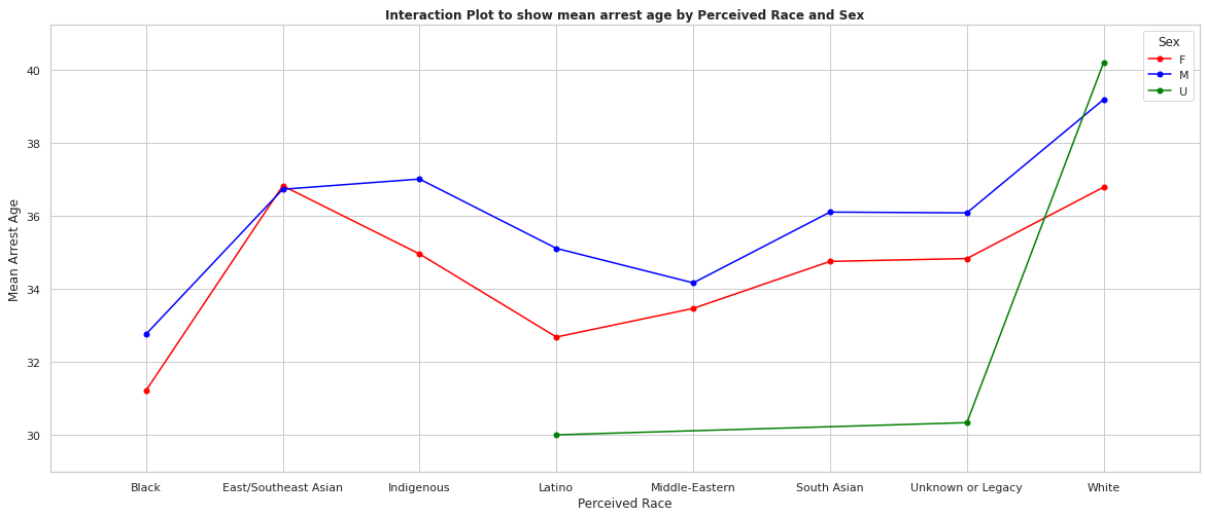

Figure 19: Interaction Plot to show mean arrest age by Sex and Perceived Race

We see that (a) As earlier indicated by our t-tests, females tend to have a lower arrest age than males for all races except Southeast Asian. (b) We do not have a lot of data for the Undefined gender (c) the difference in arrest age follows the same trend across all races.

Discussion

Through EDA, t-tests, and one-way and two-way ANOVAs, we examined the research questions we began with. With a combination of all these tools, we could answer our questions. Let's dive into them one by one again.

Is there any significant difference in age at arrest between combative individuals and those not during an arrest?

We saw from both our t-tests as well as our two-way ANOVAs that the binary categorical variable, combative, was not significant in predicting the arrest age of an individual across all races. Moreover, we tried to examine whether we could get a different result using the cooperative variable. While the interaction of Cooperative was a significant variable, its interaction with Perceived Race was not. The ambiguity on the definition of combative being false and cooperative being true makes this variable questionable – more on this in the Limitations section. Nonetheless, we conclude that there is no significant difference in age at arrest between individuals who were combative or not.

Are there significant differences in age at which individuals of different races are subjected to strip searches during an arrest?

This question was conclusively answered with our two-way ANOVA after our initial positive results from our t-tests. As indicated by Figure 14, there is a statistically significant difference between the age at arrest for people who were strip searched and those who were not, which depended on their race, as we saw in Figure 15. Those who were strip-searched were at a younger age at the time of the arrest. We looked at this in more depth by delving into whether the strip search yielded any item or not. But that resulted in inconclusive results. In summary, there are significant differences in age at which individuals of different races are subjected to strip searches during an arrest. Why does this occur? Perhaps younger arrested individuals seem more suspicious to the police which is why they are subjected to a strip search.

Are there any statistically significant differences in the mean age of arrest between different groups defined by sex and race?

Our last two-way ANOVA definitely answers this question too. From Figure 18 we found that our individual variables as well as the interaction between sex and perceived race were statistically significant. The interaction plot in Figure 19 further confirmed that there are statistically significant differences among levels of sex and perceived race. Non-white races tend to have a lower arrest age compared to white individuals. Moreover, females have an arrest age than males. Hence, we conclude there are statistically significant differences in the mean age of arrest between different groups defined by sex and race.

Based on the analysis and literature review, the findings suggest significant differences in the age at which individuals of different races and sexes are arrested. In other words, sex and race determine the age you get arrested. Additionally, our results match with what the literature is saying. Furthermore, individuals of a particular race are more likely to be strip-searched at a younger age, supporting the hypothesis that race is a factor in the age at which strip searches are conducted. However, the research showed no significant relationship between combative action during arrest and age. While physical abilities such as strength, speed, and aggression are useful for successfully committing many crimes, aging is associated with notable declines in energy and physical strength, which may make crime too dangerous or unsuccessful. These results highlight the importance of considering demographic factors when analyzing arrest data and developing policies to address the issue of criminal involvement. Further research is needed to understand the causes of disparities in the criminal justice system, particularly for over-represented Black males.

Limitations

One of the limitations of this study that we would like to point out is that the perceived race of an individual is determined by the police officer. What this results in is that if a person is arrested multiple times by different police officers then the person's perceived race may be different. For example, Person ID 327535 was first identified as Black on their first two arrests, and then South Asian on their third arrest. This is a major limitation of our data that we had to bear with during our study. There were plenty of outliers in terms of the number of arrests, but one interesting data point

that stood out was the maximum number of arrests: one individual was arrested a staggering 54 times.

Moreover, some variables were a little confusing and overlapped. For example, there are two features called Combative and Cooperative, which are binary categorical variables. A question arises on if a person is Combative does that mean they are not Cooperative and vice versa? No such pattern holds in the data. We found different results for these two variables in our t-tests and ANOVAs.

Lastly, we could make our analysis more visual by mapping the arrest location with the Police division that made the arrest. That would have shown if there were any arrest biases by neighborhood or police activity.

Conclusion

In conclusion, the statistical analysis performed on the arrest data revealed several noteworthy findings. The binary categorical variable "combative" was not a significant predictor of the arrest age of an individual across all races, as determined by both t-tests and ANOVAs. Additionally, there was a statistically significant difference in the age at arrest between individuals who were strip searched and those who were not, which was dependent on their perceived race. The interaction between sex and perceived race was also found to be statistically significant.

One limitation of this study is that the perceived race of an individual is determined by the police officer, which may result in discrepancies if the same person is arrested multiple times by different officers. Future work could involve additional literature and data searches on related topics to further explore the relationship between arrest and demographic factors.

Overall, the findings suggest that demographic factors such as race and sex may play a role in the age at which individuals are arrested and whether or not they are subjected to strip searches. However, further research is needed to fully understand the complexities of these relationships and their implications.

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