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Public Transportation in Central Florida: Setting the Tone for Public Rail Use

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PUBLIC TRANSPORTATION IN CENTRAL FLORIDA: SETTING THE TONE FOR PUBLIC RAIL USE

by

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ABSTRACT

The purpose of this research is to analyze the use of the public train usage in Central Florida to determine the feasibility of high-speed rail usage in the future. This study will be split into parts and expanded upon. The first part will observe rider perspective, values, and issues regarding rail transportation as is available in Central Florida. In further installations, which will be conducted separately from this thesis, there will be an analysis of the providers of rail transportation. It is hypothesized that there will be a moderate demand for rail transportation used by the public.

DEDICATION

I'd like to dedicate this research to my sister, Skylar Johnson. Gone too soon but loved forever. I will never forget the way you laughed and dreamed. You were my best friend, sister, roommate, and diary. To this day, you know me best. I remember when we lost you and the world felt bleak. I lost hope in a good life. Yet when we arrived home after hours of crying and wondering what was next, there you were. Butterflies covered our home. Now, even in the coldest winters when I'm alone and my heart aches from missing you, a butterfly will show itself. I know that God is protecting you with His mighty love and glory. One day, we'll see each other again. If you were here, we'd throw the biggest party and you'd still push me off the bed at the end of the day. This one is for you. Thank you for being my eternal guiding star.

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To begin, I'd like to thank the Burnett Honors College for providing me with the opportunity to partake in research as an undergraduate student. The challenges I've faced while completing this process have taught me the meaning of keeping an open mind while staying true to my work.

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My family: Thank you hyping me up during this process. You listened to me ramble on and on about trains. I knew it wasn't your thing, but I appreciate the effort. Saying, "Wow, tell me more!" or "Really?" made me excited to research even further. Those moments made me believe that my research was worthwhile and that perhaps I could share a different perspective in this field. Thank you for loving me from afar as I studied and lived states away. Your little girl is growing up. For those of you who joined me in Florida, I could never say thank you enough times. I will forever be grateful that you were by my side. I love you all to the moon and back.

God: To the one and only, the Father of all fathers. Without Your strength, I am nothing. Without Your grace, I am stained. Everything that I've completed has been through You. Lord, You have blessed my life and given it reason. My challenges, and there are many, have given me stories to share and a light to shine. It is ultimately through You that I am where I am today and where I will be tomorrow. As I move into the next chapter in my life, I will remember Your word. "But when I am afraid, I will put my trust in you," Psalms 56:3 NLT.

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CHAPTER 1: INTRODUCTION

Study Background

The purpose of this research is to analyze public train usage in Central Florida to determine the feasibility of increased rail usage in the future. With projects appearing across the country to recreate high speed rail as seen in Europe and Asia, it is a wonder if transportation stakeholders within the state, both private and public, are thinking to do the same. This study is meant to be the beginning portion of a larger study that analyzes the feasibility of high-speed rail in the United States. However, it is necessary to look at where the rail industry is currently heading before high-speed rail becomes an option. Specifically, this study is analyzing the pioneers of modern-day rail focused on public transportation as opposed to the transport of goods and how well that is being accomplished.

With the current expansion of public rail transportation across Florida, particularly in Central Florida, this study may serve Orlando in understanding and increasing ridership. Ridership is necessary when measuring the success of public transportation along with cost benefit analyses.

Hypothesis

With public transportation, there is no one ridership perspective to consider. Train operators must adhere to mass travel patterns, economic demographics, and miscellaneous needs when providing rail transportation. Such information determines where to place stops, when to run the train, and how far track should extend. Likewise, when determining their effectiveness, it

cannot be focused on one centered idea of ridership. Therefore, four hypotheses will be provided in this study to analyze public train usage, specifically focused on the Sunrail provided in Orlando.

H_1 – People who value location.

Those who are more conveniently located near Sunrail stops are more likely to use the Sunrail train. Location is important when determining who is likely to use trains. Consequently, direction is heavily tied to the stops available. In the United States, where land is so spread out that cars remain a necessity, having stops that fit into the mass's lifestyles will impact their decision to use public transportation. The Orlando Sunrail station has accomplished this feat to an extent. For example, allowing someone who lives in Sanford, Florida to work at Advent Health downtown so long as they live near the station.

H_2 – People who value time.

Those whose schedule more conveniently align with the Sunrail schedule are more likely to use the Sunrail train. Currently, Sunrail has two main schedules. Northbound, which runs from 5:45am to 11:23pm arriving every 30 minutes during the morning and evening and less during the mid-day. Southbound, which runs from 5:30am to 9:43pm arriving every 30 minutes during the morning and evening and less during the mid-day. Both schedules include 1-hour breaks between morning and mid-day, as well as mid-day and night. The train does not operate on weekends or holidays. This schedule alone may be one of the most determining factors in ridership.

H_3 – People who value freedom.

Those who perceive cars as providing more freedom than train routes are less likely to use the Sunrail train. Currently, Sunrail provides rides from Debary to Poinciana, a little over 60 miles. There is no east to west travel provided, making last minute stops or detours not an option. On the other hand, Sunrail runs on its own schedule and travel time isn't determined by traffic conditions. Therefore, the value of freedom is up to individual interpretation.

H_4 – People who value safety.

Those who perceive trains to pose more of a health and safety hazard are less likely to use the Sunrail train. With news of trains hitting cars, although rare compared to car accidents, it may still cause weariness. With the rise of the COVID-19 pandemic, mask wearing, and social distancing, being in an enclosed space on a train may be influencing ridership.

Limitations

The study population consists solely of a portion of UCF students, faculty, and staff. Therefore, the results will not be generalizable. Survey questions will only be regarding the Sunrail station in Central Florida. Starting with a small, concentrated population and service may allow a basis to draw from when expanding this research to private and high-speed rail, ridership needs for those with specific life schedules, and whether the current rail system is sufficient enough to sustain future growth and collaboration.

CHAPTER 2: LITERATURE REVIEW

Historical Context

Since their conception, trains have proven to be a useful mode of transporting goods. As they began expanding, it became more diverse in use from stowaways seeking a better life, to adventurers testing their limits. Trains have even been found at the center of pop culture with mysterious crime books such as *Murder on the Orient Express* and zombie, horror films like *Train to Busan*.

Despite its mass influence, the impact of the railroad has been underrepresented in the United States. Many believe the turning point in American society to be the transition from horseback to automobiles and from automobiles to airplanes. Although both feats made a monumental difference, trains were the backbone of a much-needed industrial revolution which is, on a grand scale, responsible for the power America and many first world countries hold today.

The primary modes of transporting goods were a joint effort between walking, sailing, and horseback riding. However, this was not an everyday for the average laboring citizen. The conception of regular commuting did not begin until the early 19th century in times of war, a recurring dynamic in the transportation industry. According to Stephens, "the conflict between England and France frequently disrupted trans-Atlantic commerce" which developed a need for domestic production, leading to a new period of industrialization and an urban workforce (Stephens, 2018 p. 21). The primary way to commute was by walking or using horseback, which worked temporarily given the smaller population compared to modern day.

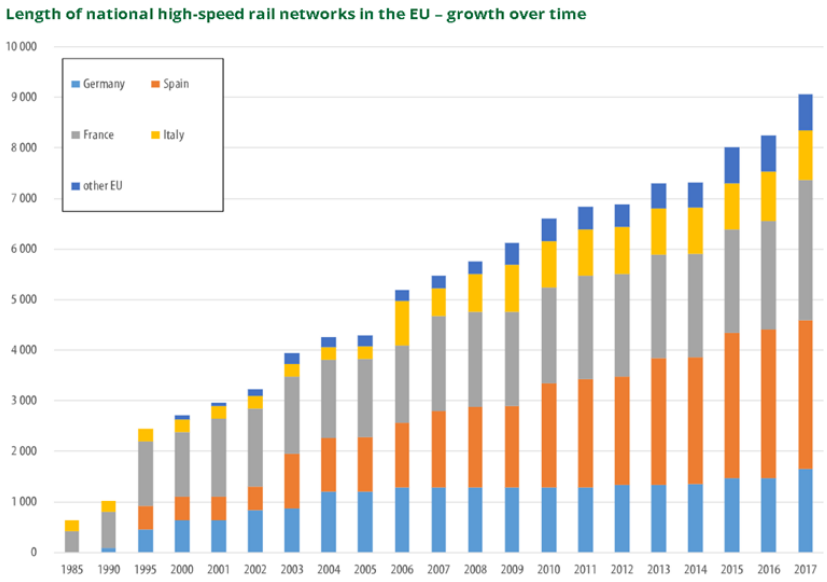
The railroad age hadn't started until 1830 with the Liverpool and Manchester being the first inter-city railway in England. It was open “for the carriage of both freight and passenger” which set a standard for proper railway transportation that was quickly imitated (Wolmar, 2013, p.16). The United States was not far behind with William Strickland, civil engineer, suggesting railroads as an alternative mode of transportation in 1826 after visiting various British railroad projects. By 1835, “there were nearly 1,000 miles of completed railroad on thirty-nine lines in the United States” marking one of the largest technological transformations in early American history (Wolmar, 2013, p. 23). With such new steam technology came safety concerns from passengers and incidents occurred such as the Best Friend of Charleston’s locomotive explosion in 1831. Although trains have come a long way since that time, they are not without incident or repercussions as will be discussed later.

Railroads experienced a boom during the first World War playing a vital role in the transport of troops and weaponry. That boom rapidly declined once the war ended, leaving overused and expensive railroads with negative profit margins fending for survival and their competitors approaching right behind them. The downfall of the railroad in the United States was “a combination of public demand, technological developments in the automobile industry, incoherent regulation, government policies, and subsidies favoring rival modes of transportation” that began the road dependency seen today (Wolmar, 2012, p. 293). Automobile demand, and eventually aviation, quickly spread worldwide in the twentieth century, but this did not entirely curb the use of railroads in the United States or their improvement overseas.

When the Congressional Passenger Service Act was passed, the goal was to “[consolidate] the U.S.'s existing 20 passenger railroads into one” thus creating Amtrak, a rail passenger service

that currently spans across 46 states (Amtrak Blog 2022). Overseas, railroads were progressing leaps and bounds into new territory and capabilities.

A new category of fast, electric trains had been manufactured in 1957 by Hideo Shima, a Japanese engineer, and operating by 1964 (Zoellner, T., Ferriss, A, 2014, p. 46). Named Shinkansen, or bullet train, they would usher in an era of high-speed rail that had once felt fantastical to imagine. Though the Shinkansen has been a monumental advancement, it isn't widely used outside of Japan. This may be due to the surmounting costs required to build the train. High speed rail alone is an expensive feat, but that doesn't stop countries, or American states, from taking on the challenge for even a fraction of the benefits. Most notably, California is the first state in the United States to tackle implementing high speed rail, bullet train or otherwise, in their transportation system. According to the California High Speed Rail 2020 Business Plan, they're estimating from $69.01 to $99.9 billion to implement a 500-mile system that spans from San Francisco to Los Angeles (California High Speed Rail, 2022). In Europe, high speed rail was first implemented in 1977 Italy and the concept quickly spread across the continent. Although there isn't a "single European high-speed rail network," there has been substantial growth in their networks from 1985 to 2017 (European Court of Auditors, 2018). With early



implementation of high-speed rail in Europe and Asia, and the United States' first strong push for railroads during industrialization, what is holding the U.S. back from widely implementing new, high speed rail technology in the 21st century?

Automotive Industry

Americans were not fully invested into the auto industry until after the second World War. With the need for industrialization and public commuting, automobiles were considered an option for the wealthy. Trains were not the comforting, accessible feat that has been achieved today, either. There weren't Amtrak sleeper trains; instead, people were heavily aware of the crowded and unkempt spaces they traveled in. Passengers also had no control over the speed, direction, or stops taken because the trains ran on a specific schedule. Automobiles were being embraced due to the "revived the promise of individual freedom" (The Henry Ford, 2021). How long a family took to travel or where they decided to stop was no longer an issue and even women "were increasingly venturing out into public spaces" for enjoyment (The Henry Ford, 2021).

Travel became a growing commodity and states found ways to profit as well starting with the 1940 Pennsylvania turnpike, the first of many toll roads. By 1965, the federal government also stepped in with the Federal Aid Highway Act creating an "interstate highway system…for average citizens to reach their destinations" as well as for military purposes. (The Henry Ford, 2021). Since Americans began relying on cars for transportation, train systems began to shift in more profitable directions. The relationship between freight trains and the automobile industry was and continues to be vital due to freight delivering materials to build vehicles and delivering

whole vehicles as well. Given the “nearly $24 billion” spent annually to maintain track and train upkeep, working primarily with shipping as opposed to consumers allowed companies to keep up with maintenance and even turn a profit (Association of American Railroads, 2022). However, a new generation has shown interest in trains over cars.

One issue that may not have been accounted for to the extent it has reached, is the population increase in the United States. A higher population effects the number of cars on the road. When the interest in cars began booming, it was heavily influenced by cheap prices and availability. As time marched forward, so did the increase in highways, car prices and gas with little to no increase on wages or accessibility. According to the Department of Labor, the last minimum wage increase was to $7.25 per hour on July 24, 2009, though may states have taken the liberty of expanding far beyond that (U.S. Department of Labor, 2022). In 1970, the average car price was $3,542, however, by 2022 the average new car price is $47,000 according to Consumer Reports, 2021. Accounting for inflation, the average car price in 1970 with 2022 prices would be $26,940.19 according to the Bureau of Labor Statistics inflation calculator. Cars are also not as common with people of disabilities given the lack of accessible options and the costly process of getting an accommodating vehicle.

Highway congestion and pollution are two of the most substantial arguments against the automobile industry. Population increase is the main cause for increased traffic and adding roads is a temporary solution to a growing issue. Alternative action has been suggested, such as “eliminating the handful of bottlenecks” to make travel more efficient. This includes widening ramps, adding exit and breakdown lanes, and encouraging the use of HOV lanes (Forth Plan, 2022).

According to the U.S. Environmental Protection Agency, “The average passenger vehicle emits about 404 grams of CO2 per mile” (2021). Greenhouse gas emissions also encouraged the use of cars by drilling for oil. Many companies are switching to hybrid or fully electric powered vehicles to mitigate these issues, most notably, Tesla, Xpeng Motors, and Nissan. The generation of electricity may continue to emit carbon, but it’s typically “lower levels of greenhouse gasses (GHGs) than an average new gasoline car,” (U.S. Environmental Protection Agency, 2021).

The automotive industry remains the primary mode of transportation in America and with environmental safety in mind, continues to adapt to public needs. However, with increased frustrations in high prices, people may be beginning to experience a similar frustration as early train-goers. This is causing a large shift in the cost and benefit of train service, which will be explored in further studies.

Public, Private and Unestablished Rail

There are few public, private, and unestablished entities that are expanding or influencing the decision to expand rail usage in the United States, each with their own consideration to make. By interconnecting public and private transit, there’s a reduction in the need to lay extra tracks. However, the more companies that arise to provide high speed rail, the less available land there will be. In theory, the likely method will look a lot like Europe. There will not be one rail system, but a series of privately and publicly owned railways that will connect to make a seemingly coherent railway system.

Before diving into the cost-benefit analysis of high-speed rail, the major contributors should be established. In Orlando, Florida, the Sunrail is a widely used mode of transportation.

According to Sunrail's 2021 monthly ridership report, there were over 324,000 riders from July of 2020 to January of 2021. However, with a population of over 1.3 million, ridership could be higher. Sunrail's ridership relationship is what will be explored in this study.

Next, there is Amtrak. Amtrak is the only comprehensive passenger railway system that spans across the United States. Despite the push for Amtrak to become high speed, it is unlikely to happen. Amtrak is owned by the federal government, yet "seventy-five percent of the miles traveled by Amtrak trains are on tracks owned by other railroads" because they are host railroads that are paid for timely performance and operations (Amtrak Corporate Profile, 2020, p. 3). Prior to the internationally devastating effects of the COVID-19 pandemic, Amtrak recorded 32.5 million trips on more than 300 trains (Amtrak, 2019, p.3).

Brightline is a privately owned train company in Florida. It currently runs from Miami to West Palm Beach and is working on an extension to Orlando that's expected to be completed in 2022 and run at a minimum of 125mph. The full extent of their expansion is to connect from Miami to Tampa. (Brightline, 2022). Brightline is also working to expand to the west in their Brightline West project as they communicate with the California High Speed Rail Authority on connecting Las Vegas to Los Angeles. Brightline West is expected to work up to higher speeds of 180mph with the use of "zero-emission, electric train sets" to reduce carbon footprint (Brightline, 2022).

California High Speed Rail is an incredibly ambitious project, being the first of its kind in the United States. Due to the incomplete construction, this system would be considered an unestablished railway. California is known for its ambitious efforts to use more sustainable and renewable energy and currently leads the country. Now, it's looking to do the same in

transportation. The success or failure of this program, as well as the costs associated with it, will

be a large determining factor in whether other states will attempt to follow suit. California High Speed Rail is publicly and privately funded and they're currently working with private companies such as Brightline to connect to Las Vegas.

Texas Central is another unestablished rail. The company's goal is to connect Dallas and Houston via the Shinkansen. Construction for this project was set to start in 2020 but was unable to due to the COVID-19 pandemic. According to Texas Central, their railroad "will not seek grants from the US Government or the State of Texas," but that statement has been hard to follow (Texas Central, 2022). The company is currently seeking federal and private funding. Funding for high-speed rail comes with unexpected shifts, as the production reality often far exceeds the expectation. Currently, the California High Speed Rail product is over budget by around $5 billion according to their Draft 2022 Business Plan (2022). There is support for Texas Central in theory, however, the company is receiving push back from representatives for, "[lacking] a single permit to construct" as well as being over budget and behind schedule (Michael McCaul Press, 2021).

Ridership Perception

Although the United States is currently unable to produce a high-speed railway, public or private, it may be possible to measure whether that necessarily has a large impact on current public transportation. Are riders likely to switch from using slower public transportation to a faster railway such as Brightline on speed alone? There are several determining factors, but it can begin by narrowing it down to three categories: ridership perception, NIMBY and SPRAWL.

There are two subsections of ridership perception, freedom and safety. The transportation industry is far more regulated today than at conception, as most industries are. Trains are no longer just a fun, innovative idea, but a serious transportation option that comes with expenses, pitfalls, and overall benefits to be considered. It is also important to consider high speed rail's main competitor, automobiles, in ridership perception.

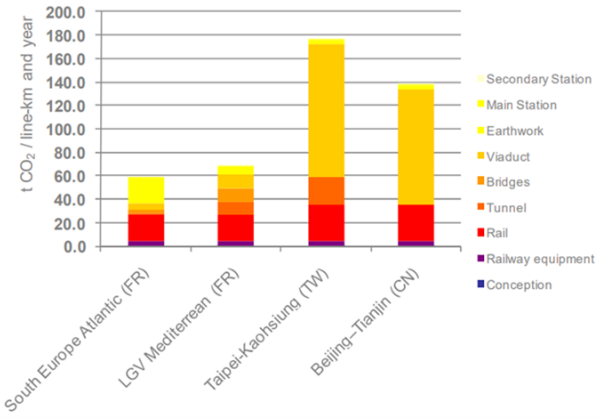
Perception of Freedom

Suburban citizens are attempting to recreate the flexibility of urban living with the rising interest in public transportation. What's interesting about this shift is the previous decrease in urban population as people sought lower crime rates and improved public health (Stephens, 2018). The freedom that cars and long spanning roads once provided has become a crutch for people seeking life outside of cities where most jobs are present.

Perception of Safety

As stated earlier, railroads came with safety risks due to their steam technology. Boiler explosions were common in the early days, but as regulations increased and technology improved, such explosions were few and far between. A large safety issue with the implementation of high-speed rail in the U.S. lies in the use of existing tracks to save time and money. A safety threat would be "collisions between tilting trains" because the tilting action "is one of the normal operating conditions" of these trains (U.S. Department of Transportation, 1992, p. 3-20). To mitigate this issue, the tracks will either be adjusted for the train or vice versa. Another way to mitigate the chances of collision would be to install ATP equipment "that is designed based on fail-safe principles" such as the British Rail which will not begin high speeds until ATP is deployed (U.S. Department of Transportation, 1992, p. 3-21).

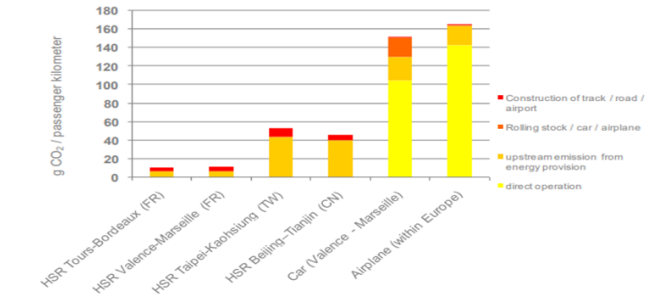
Figure 1.1: Carbon emission in t CO_2 due to construction per km of line and year



Fuel consumption and pollution have also been major concerns regarding transportation, which is why some look towards high-speed rail as an alternative when powered by electricity. Pollution cannot be spoken of in a general term, the type of pollution is important. For high-speed rail, construction is where there are harmful greenhouse gas emissions. The carbon footprint from the construction of four high speed railways in Asia and Europe "is in the range of 58 t – 176 t of CO2 per km of line" (International Union of Railways, 2011, p. v). In the same carbon footprint study by the International Union of Railways, "the carbon footprint of road transport (car) and air transport" was measured using the "same methodology and emission factors" for their comparison to high-speed rail. According to their study, track construction, rolling stock, and operation provided a carbon footprint "14 to 16 times less" than car or airplane (International Union of Railways, 2011, p. vii).

Table 1.2: **Carbon Footprint of traffic modes on route Valence – Marseille in France**

	High Speed rail (LGV Med)	Car (Road)	Airplane (European flight)
Construction of track / road / airport	4.3 g CO_2 / pkm	0.7 g CO_2 / pkm	0.3 g CO_2 / pkm
Rolling stock / car / airplane	1.0 g CO_2 / pkm	20.9 g CO_2 / pkm	0.5 g CO_2 / pkm
Operation (including upstream emissions)	5.7g CO_2 / pkm	130 g CO_2 / pkm	163.2 g CO_2 / pkm
Grand sum	**11.0 g CO_2 / pkm**	**151.6 g CO_2 / pkm**	**164.0 g CO_2 / pkm**



[3] These figures highly depend on the used electricity mix (CO2 per kWh), the load factor, and the number of trains that use HSR infrastructure.

Although carbon emissions are heavily considered by environmentalists when deciding to place trains, a consideration for the average person may come from current social issues such as the COVID-19 pandemic.

NIMBY

Car manufacturers have little concern over land use for their vehicles. The creation of roads is left up to local and county governments. However, land acquisition is a vital part of train service. In order to create the most efficient route, running tracks through public and private

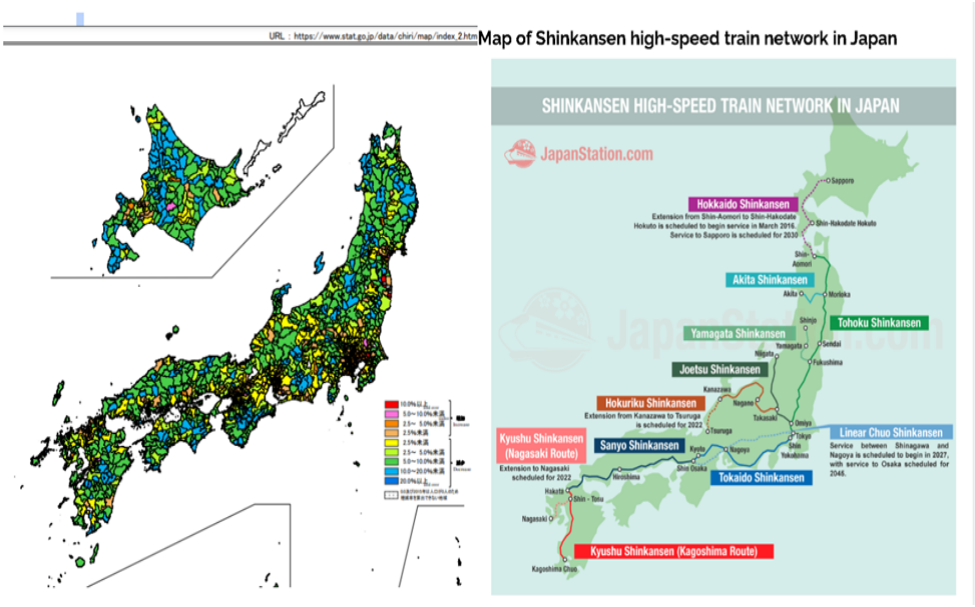
property will be unavoidable. Public entities have more to gain by allowing trains to use their land, but private landowners may not. Implementing railways may cause.

The argument “not-in-my-backyard” or NIMBY for short, is the concept that although a project may be important and necessary for a community, the solution shouldn’t have to be placed in an area that disrupts citizens. NIMBY affects local planning by creating a difficult choice between public interest and private rights. Some urban and industrial planners consider NIMBYs to have a “systemic distrust of public and corporate expertise” by actively preventing social and environmental improvements (Gibson, Timothy, 2005, p. 381). Is the concept of securing one’s private land intentionally selfish? It can be, especially when the alternative option is to build through an impoverished neighborhood, weakening the argument. NIMBY may be more effective when arguing against railroads, as they haven’t been deemed a necessity.

There are also cases where NIMBY has failed. California High Speed Rail and Florida’s Brightline have turned towards eminent domain to acquire land. Eminent domain “refers to the power of the government to take private property and convert it into public use” with just compensation to the owners (Cornell Law School, 2022). However, this is not a failsafe and may take years to settle, causing delays and construction costs to increase. As for families and business owners, eminent domain can disrupt livelihoods. In the case of Texas Central, the use of eminent domain on Leon County farmers was originally denied on the account that Texas Central was not a railroad due to not having any rails laid. This decision was eventually overturned in appeals court.

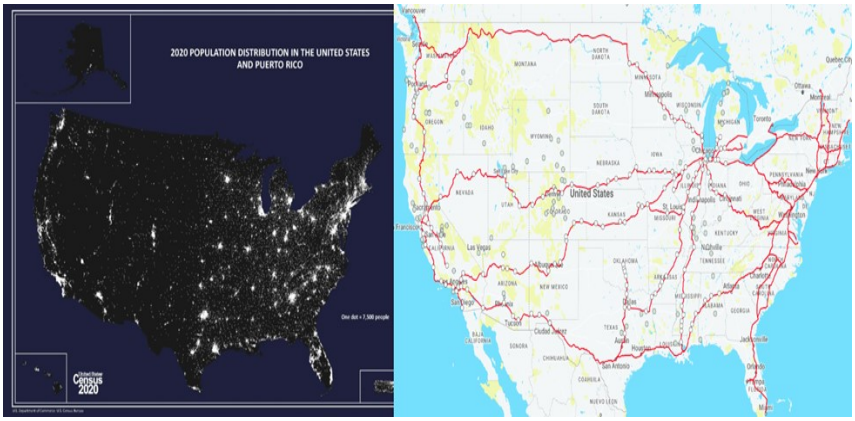
SPRAWL

A question regarding high-speed rail is whether the United States may be large of a country with a population far to spread out. One could go from end to end in Japan by railway alone, but Japan is 145,937 mi² which is smaller than the state of Texas at 268,597 mi². Compare that to the size of the mainland United States at 3.797 million mi² and the issue becomes apparent to some degree. The 2020 U.S. population distribution, as reported by the census, shows most of the population clusters along the coast, near lakes and rivers, and at major cities. Japan is similar in that most of



the population clusters are along the coast and major cities. Citizens are not likely to be using the train system to travel from Hakata to Sapporo daily but are instead using the system to travel to nearby cities. When comparing Japan's population census map (Statistical Maps of Japan, 2020) to a map of their transit system, the population clusters align with the stations. Although it's not high speed, when comparing Amtrak's map to the 2020 census U.S. population distribution map, it follows a similar pattern, missing a few smaller cities that citizens may want to travel between.

For rail transportation, high speed or otherwise, it appears that the goal is to follow along major



population areas as opposed to covering the entire country in tracks. So, let's look at this on a smaller scale. The state of Florida is smaller than Japan at 65,758 mi^2 and holds similar population clusters where one would see railways. As stated earlier, it may be easier to follow a similar pattern as Europe by forming multiple well-functioning railways and connecting them to create one comprehensive system that spans across the United States. This can be achieved by following modern population clusters, which Amtrak has accomplished, not including a few cities that local governments may cover. The next step in this process would be for these entities, Amtrack, Brightline, Sunrail, to form a partnership and increase ridership.

Ridership is the overall focus of this thesis, and the survey will hone in what may lead effective ridership or what's driving riders away from public rail transportation. The goal is that this study may be replicated so that local, state, federal, and private railways may form proper partnerships that benefit the rider and create a comprehensive rail system in the United States.

CHAPTER 3: METHODOLOGY

Overview

As stated, the purpose of this research is to analyze public train usage in Central Florida to determine the feasibility of increased rail usage in the future. The overall goal is to create a replicable survey that may be used to determine the possible ridership response to high-speed rail. For this to be effective, the survey must consistent of a multitude of issues that may positively or negatively effect ridership.

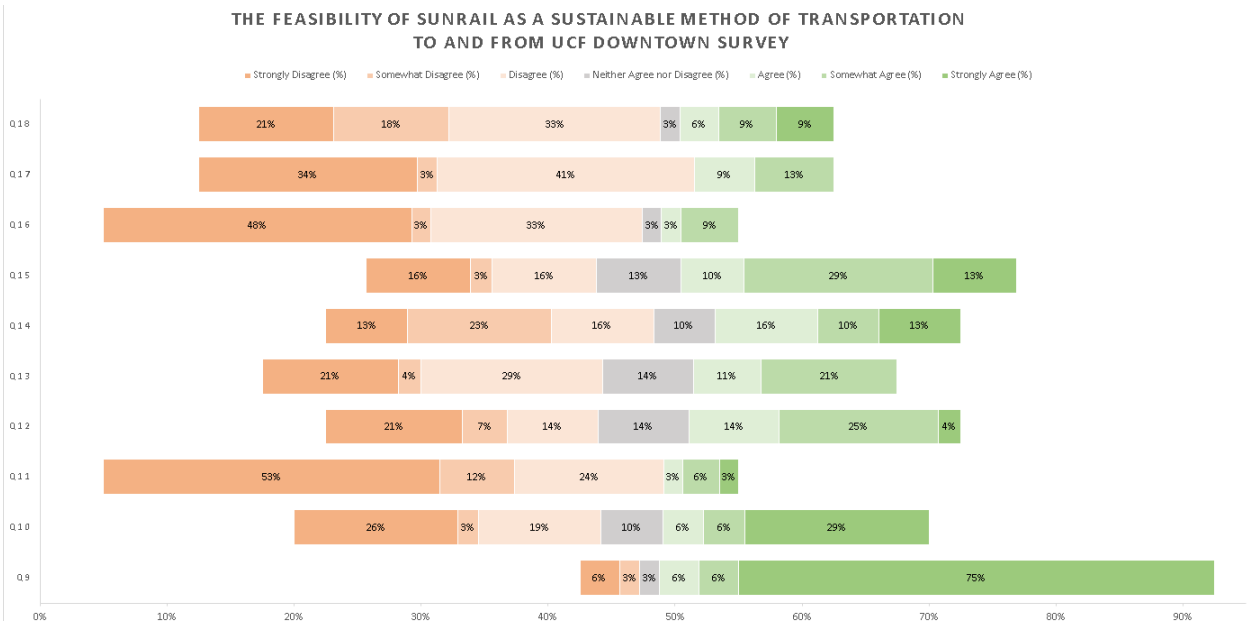
Community Selection

The study is set in the state of Florida with participants consisting of students, faculty, and staff from the University of Central Florida. The sample is determined by proximity and availability of participants. A survey will be distributed to collect data. This community was partially chosen due to time and outreach constraints, therefore, making the study ungeneralizable and only representative of the few who participated in the survey.

Measurement & Procedure

Measuring perception produces qualitative data. The survey does not measure specific data such as how long a person rides the Sunrail, how often they ride the train, or what times. Instead, it aims to understand why someone who could benefit to use the Sunrail train may choose to or not to ride. The survey is meant to provide a window into a possibly larger study that may be duplicated to analyze a wider selection of participants.

CHAPTER 4: SURVEY RESULTS



Overview

Perception of Location

Questions 9 through 11 ask specifically about location. Answer choices range from Strongly Disagree to Strongly Agree, with Neither Agree nor Disagree as the middle ground. This scale is used through to the 18th question. Q9 states, “The location of a Sunrail station to my house has an impact on my decision whether or not to ride Sunrail to and from UCF Downtown”. Out of 36 responses, 87% agreed, 9% disagreed, 3% were neutral.

Q10 states, “The location of the Sunrail station from the UCF Downtown campus (Lynx Bus Station) has an impact on my decision whether or not to ride Sunrail to and from UCF Downtown”. Out of 33 responses, 41% agreed, 48% disagreed, and 10% were neutral.

Q11 states, “The location of Sunrail stations has no influence on my decision to ride or not ride Sunrail to and from UCF Downtown.” Out of 43 responses, 12% agreed, 89% disagree, and 0% are neutral.

When observing the responses, Q9 and Q11 mirror each other almost exactly. Participants are confirming that the location of the Sunrail station heavily influences their ridership. However, Q10 is nearly even in responses. This may be due to the focus of which location is being referenced. Although most participants attend or work at UCF Downtown, the responses are hinting that it’s not the sole reason that they do or do not ride the Sunrail. It appears that the participants value proximity to their starting point, i.e., home, more than the proximity to their end point. Note that most participants drive their own car instead of taking the Sunrail. It’s possible to infer that the train’s proximity to their starting point has had influence on that decision.

Perception of Time

Questions 12 through 14 ask specifically about scheduling. Q12 states, “The Sunrail train schedule works with my schedule for me to ride it to and from UCF Downtown.” Out of 31 responses, 43% agree, 42% disagree, and 14% are neutral.

Q13 states, “I would ride Sunrail to and from UCF Downtown if the train schedule were more convenient for my schedule.” Out of 28 responses, 32% agree, 42% disagree, and 14% are neutral.

Q14 states, “The Sunrail train schedule has no impact on my decision to ride it to and from UCF Downtown.” Out of 34 responses, 39% agree, 52% disagree, and 10% are neutral.

The responses to the train schedule are almost even, though slightly leaning towards disagreement. It's not a significant enough response to infer whether the train schedule is convenient and would therefore benefit from extending times to increase ridership.

Perception of Freedom

Freedom may be interpreted through the data as a combination of location accessibility and timing. Given the results of questions 9 through14, one can infer than location is valuable to those who consider riding the Sunrail, however, the train schedule does not decrease or increase the likelihood that they'll ride.

Perception of Safety

Questions 15 through 18 ask specifically about safety. Q15 states, "Even though I could take Sunrail, I prefer to drive my car to UCF Downtown." Answer choices ranged from Strongly Disagree to Strongly Agree. Out of 38 viable responses, x% agreed overall and x% disagreed overall.

Of those who prefer to use their cars, there shows a correlation that safety does impact their decision to not use the Sunrail train. Q16 states, "The concern that I could be physically hurt impacts my decision to ride Sunrail to and from UCF Downtown". The significance between Q15 and Q16 is .524 (2-tailed). Q17 states, "The thought of sitting on a crowded train prevents me from riding Sunrail to and from UCF Downtown." The significance between Q15 and Q17 is .243 (2-tailed). Q18 states, "The concern of catching COVID on Sunrail prevents me

from riding it to and from UCF Downtown." The significance between Q15 and Q18 is .025 (2-tailed). Given that correlations are significant at the .05 level, one can infer that the rider's perception of safety overall makes a significant impact on the decision drive instead of riding the Sunrail. However, the significance of COVID-19's impact on perception of safety is low.

Correlations

		Transportation	Q9	Q10	Q11	Q12	q13	Q14	Q15	Q16	Q17	Q18
Transportation	Pearson Correlation	1	.172	.185	.027	.293	-.203	-.117	-.010	.286	.006	.365*
	Sig. (2-tailed)		.315	.280	.875	.082	.236	.496	.955	.090	.973	.029
	N	37	36	36	36	36	36	36	36	36	36	36
Q9	Pearson Correlation	.172	1	.195	-.221	-.075	-.245	-.204	-.202	.107	.165	.062
	Sig. (2-tailed)	.315		.255	.195	.663	.150	.234	.237	.533	.335	.719
	N	36	36	36	36	36	36	36	36	36	36	36
Q10	Pearson Correlation	.185	.195	1	.013	.266	.086	-.337*	.203	.480**	.089	.259
	Sig. (2-tailed)	.280	.255		.938	.117	.616	.045	.234	.003	.690	.127
	N	36	36	36	36	36	36	36	36	36	36	36
Q11	Pearson Correlation	.027	-.221	.013	1	.111	.212	.118	.339*	-.132	.144	.113
	Sig. (2-tailed)	.875	.195	.938		.517	.214	.493	.043	.442	.403	.511
	N	36	36	36	36	36	36	36	36	36	36	36
Q12	Pearson Correlation	.293	-.075	.266	.111	1	-.001	-.009	.042	.222	-.109	.182
	Sig. (2-tailed)	.082	.663	.117	.517		.994	.958	.806	.192	.529	.287
	N	36	36	36	36	36	36	36	36	36	36	36
q13	Pearson Correlation	-.203	-.245	.086	.212	-.001	1	-.217	.253	.115	.054	.220
	Sig. (2-tailed)	.236	.150	.616	.214	.994		.203	.136	.504	.754	.197
	N	36	36	36	36	36	36	36	36	36	36	36
Q14	Pearson	-.117	-.204	-.337*	.118	-.009	-.217	1	.228	-.058	.320	-.010
Q17	Pearson Correlation	.006	.165	.069	.144	-.109	.054	.320	.200	.173	1	.557**
	Sig. (2-tailed)	.973	.335	.690	.403	.529	.754	.057	.243	.313		<.001
	N	36	36	36	36	36	36	36	36	36	36	36
Q18	Pearson Correlation	.365*	.062	.259	.113	.182	.220	-.010	.373*	.355*	.557**	1
	Sig. (2-tailed)	.029	.719	.127	.511	.287	.197	.952	.025	.034	<.001	
	N	36	36	36	36	36	36	36	36	36	36	36

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

The study results provided several ideas to expand upon. Particularly, ridership is as nuanced as expect, as there hasn't been an overall reason provided as to why riders choose to use or not use public rail transportation. As mentioned, this study is not broad enough to provide a general perspective, though it has accomplished its intention of providing a window.

Beginning with the perception of location, which appears to evoke a strong response. Ridership is influenced by proximity to the mode of transportation. What's interesting is that the destination, in this case UCF Downtown, isn't as vital as the starting point. That may vary given the nature of the location. One could assume that if a stop on International Drive were provided, the results may vary further with the destination becoming increasingly important. However, even in the context of the destination being a place that nearly all participants frequent at least weekly, the assumption would be that it'd influence their ridership, but that argument doesn't hold true in this specific study. Riders still prefer to use their car because the stops in proximity to their homes are too far.

Perception of time provided the most even response. The hypothesis wasn't strongly proven, as in the schedule doesn't concern most participants given a majority use their cars. Although a schedule was provided during in the survey, the responses lacked strength, which may be due to the array of options available outside of rail transportation. Not only a car culture supported by wide highways and plentiful exits, but there are also busses, shuttles, bikes, and other resources available. It is inferred that the trains schedule may not make a difference in ridership because it's not a necessary mode of transportation.

As stated, the value of freedom is a combination of proximity and availability. Based on survey results, the Sunrail stations are not only inconveniently placed, but the schedule also holds low significance compared to the almost endless run time of alternative transportation. Therefore, it is inferred that the overall perception of freedom is low, possibly resulting in lower ridership as well.

The perception of safety was particularly interesting in that it did evoke a strong response, yet the correlation of who it impacted was expected. Based on the Likert scale data, safety isn't an overall safety deterrent for this sample group. Those who do worry about safety tend to worry about their health in closed spaces where they may contract illnesses such as COVID-19. The technology surrounding train operation appears to be considered trustworthy in this group of participants.

What is most intriguing regarding this study is that the hypothesis should be the expected result given the study community. This study consists of individuals who commute to the same location that is directly next to a train station and adjacent to a bustling city. In theory, this is the group that would rally for increased train usage due to convenience. Yet over 75% of this group drives a car instead. One could say that car culture is ingrained to a severe extent or determine that rails are truly useless after all in the United States. However, this phenomenon may be exactly why train companies should analyze their ridership further and reevaluate the layout of their systems. Is it worth sharing track with freight and excluding the demographics that are more likely to utilize the rail system? Should more funding be used toward outward expansion even at the risk of land acquisition pitfalls such as NIMBY? Perhaps these questions have been circulating through public transit committee meetings for years. Though now, there may be a

starting point to measure these issues within ridership in order to expand and improve upon current railroads both public and private.

APPENDIX A: EXPLANATION OF RESEARCH

UNIVERSITY OF CENTRAL FLORIDA

EXPLANATION OF RESEARCH

Title of Project: The Feasibility of Sunrail as a Sustainable Method of Transportation to and from UCF Downtown

Principal Investigator: Dr. Daniel Seigler

Other Investigators: Zoe Johnson, Dr. Daniel Stephens

Faculty Supervisor: Dr. Daniel Seigler

You are being invited to take part in a research study. Whether you take part is up to you.

This research project is being conducted as part of a student's Honors Undergraduate Thesis. The purpose of this research is to identify why students, faculty, staff, and administrators who work or take classes at UCF Downtown use or do not use Sunrail to get to and from UCF Downtown. This includes identifying how Sunrail train schedules, stop locations, perceived transportation flexibility, and rider's perceptions of personal health and safety impact their decision to take or not take Sunrail.

This survey is being administered online through Qualtrics, and the answers you provide are anonymous. There is no way to connect any answer you provide back to you, and the only identifying information collected in this survey is whether you are a UCF student, faculty, staff or administrator, and answering that questions is voluntary.

Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. Your decision to participate or not participate in this study will in no way affect your relationship with UCF, including continued enrollment, grades, employment or your relationship with the individuals who may have an interest in this study.

Dr. Seigler and Zoe Johnson are the only people who will have access to the raw data for this study.

You must be 18 years of age or older and a UCF student, faculty member, staff member, or administrator to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please email Dr. Daniel Seigler at Daniel.Seigler@ucf.edu

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

APPENDIX B: HUT RECRUITMENT EMAIL

Dear UCF Downtown Community Member,

You are being invited to take part in an Honors Undergraduate Thesis research study because you have been identified as working or taking classes at UCF Downtown. Whether you take part is up to you.

This research project is being conducted as part of a student's Honors Undergraduate Thesis. The purpose of this research is to identify why students, faculty, staff, and administrators who work or take classes at UCF Downtown use or do not use Sunrail to get to and from UCF Downtown. This includes identifying how Sunrail train schedules, stop locations, perceived transportation flexibility, and rider's perceptions of personal health and safety impact their decision to take or not take Sunrail.

This survey is being administered online through Qualtrics, and the answers you provide are anonymous. There is no way to connect any answer you provide back to you, and the only identifying information collected in this survey is whether you are a UCF student, faculty, staff or administrator, and answering that questions is voluntary.

Your participation in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. Your decision to participate or not participate in this study will in no way affect your relationship with UCF, including continued enrollment, grades, employment or your relationship with the individuals who may have an interest in this study.

Dr. Seigler, Dr. Stephens, and Zoe Johnson are the only people who will access to the raw data for this

You must be 18 years of age or older and a UCF student, faculty member, staff member or administrator to take part in this research study.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, please email Dr. Daniel Seigler at Daniel.Seigler@ucf.edu

IRB contact about your rights in this study or to report a complaint: If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email irb@ucf.edu.

Explanation of Research *(this will be linked to the Explanation of Research)*

Access the survey *(this will be linked to the survey)*

APPENDIX C: HUT SURVEY

Please select all the apply:

- I am a UCF Student
- I am a UCF Faculty
- I am a UCF Staff
- I am a UCF Administrator
- Other

If you are a UCF Student, do you live in a dorm at UCF Downtown?

- Yes
- No

During a typical work/school week, how often do you come to UCF Downtown?

- I do not come to UCF Downtown
- One day a week
- Two days a week
- Three days a week
- Four days a week
- Five days a week
- Other

Why do you come to UCF Downtown?

- To attend a class or classes
- To work
- To attend social events on campus
- Other
- I do not come to UCF Downtown

If you do come to UCF Downtown, what is your typical method for getting to the campus when you do come?

- Walk
- Ride my bike
- Drive my own car
- Take a UCF Shuttle
- Take public transportation (other than Sunrail)
- Take Sunrail
- Taxi/Uber/Lyft
- Other

Have you ever considered taking Sunrail to get to UCF Downtown?

- Yes
- No

If you answered "yes," did you end up taking Sunrail to get to UCF Downtown?

- Yes
- No

The following questions have you reflect on the reasons why you may have or may not have taken Sunrail (Strongly Disagree to Strongly Agree)

The location of Sunrail from my home impacts my decision to ride or not ride Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The location of the Sunrail station (Lynx Bus Station) from UCF Downtown impacts my decision to ride or not ride Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The location of Sunrail stations has no influence on my decision to ride or not ride Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The Sunrail train schedule (linked below) impacts my decision to ride or not ride Sunrail to and from UCF Downtown • Northbound Train Schedule • Southbound Train Schedule					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The Sunrail train schedule is not convenient for me to ride it to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
I would ride Sunrail if the schedule were more convenient for me					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The Sunrail train schedule has no impact on my decision to ride of not ride Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
Even though I could take Sunrail, I prefer to drive my own car to UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
I believe that driving my car allows me more transportation flexibility and freedom than riding Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The concern that I could be physically hurt impacts my decision to ride Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A

The idea of sitting on a crowded train prevents me from riding on Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A
The concern of catching COVID prevents me from riding on Sunrail to and from UCF Downtown					
Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	N/A

Based on your responses, is there anything else you would like to expand on or tell us about why you do or do not take Sunrail. (Open-ended)

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