Abstract

MATSON, AMANDA ELIZABETH. Mobile Voice: A Feminist Strengths-Based Interpersonal Approach to Mobility Intervention. (Under the direction of Roger E. Mitchell.)

Women experiencing homelessness are often unable to travel with the ease and efficiency necessary to meet their needs and improve their circumstances due to both material and psychosocial barriers to transportation resources. Despite its importance for material and psychosocial well-being, access to easy and efficient transportation is not equally distributed among social groups, specifically at the intersections of gender, class, race, age, and ability. However, research that measures and intervenes in the mobility of transit-dependent populations, including homeless women, is lacking, especially approaches that recognize both the material and psychosocial antecedents of transportation-related behaviors and perceptions.

The current study developed a brief Mobile Voice intervention that both minimized the material barrier of cost through the provision of a series of bus passes and maximized mobilization of mobility-related psychosocial resources (i.e., tangible social support and sense of control over mobility). The Mobile Voice intervention goes beyond previous mobility interventions that provided only formal information and material resources. Rather, Mobile Voice integrates the lessons of traditional transportation and mobility literatures with theory and methodologies of photovoice and feminist community psychology and elements of the brief motivational interview approach. The two-session intervention encouraged participants to document their own experiences via photography and then facilitated participant engagement in group problem-sharing and problem-solving targeted at increasing the ease and efficiency of their daily travel. Brevity of the intervention was critical to working with a highly transient population.
The intervention evaluation was carried out with a sample of 111 women either homeless or at-risk of homelessness at a day shelter for women experiencing homelessness. Participants were randomly assigned to either the Mobile Voice intervention or a more traditional intervention that attempted to minimize the material barrier of cost through the provision a series of bus passes only. To compare the interventions’ effect on the ease and efficiency of daily travel, six-day trip diaries as well as surveys were administered longitudinally at three time points (pre-test, immediate post-test, and a one-month follow-up). Multilevel analyses were used to compare the effect of both approaches on the trip-level outcomes of trip ease and efficiency as well as the intermediary process outcomes of sense of control over mobility and utilization of tangible support.

Hypotheses predicting that multilevel analyses would demonstrate a greater increase over time in both ease and efficiency of daily travel in the Mobile Voice intervention group versus the bus-pass-only group were not supported. Furthermore, participation in the Mobile Voice intervention was not found to significantly increase two intermediary processes – sense of control over mobility or utilization of tangible support – over time in comparison to the control group. However, both groups did demonstrate a significant increase in personal control in mobility over time. Low power due to low sample size as a result of recruitment and retention challenges make it difficult to draw definitive conclusions about the efficacy of the intervention. Connections between study outcomes and other sample characteristics are explored. Methodological and measurement challenges with a transient population are discussed as well as lessons learned for future research. Although the current study does not provide definitive evidence in support of the Mobile Voice intervention, it does provide an
in-depth view of the day-to-day travel and related characteristics of a population heretofore underserved and under-researched.
Mobile Voice: A Feminist Strengths-Based Interpersonal Approach to Mobility Intervention

by
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DEDICATION

To my family and friends for their continued support and to the women and staff of the Center for making this research possible. “When nobody hears you, it's really, it's like a silent cry. And so many women are, are cryin' out.” – Participant quote.
BIOGRAPHY

Amanda Matson grew up in North Canton, Ohio. She graduated with her undergraduate degree in Psychology from the University of Mount Union in Alliance, Ohio. Experiences during her time there inspired her to pursue a graduate education in community research and action, particularly to advocate with and for low-income women. Amanda obtained a Master of Science in Psychology through North Carolina State University’s Psychology in the Public Interest program. She has interned and conducted research with the Women’s Center of Wake County throughout her time there, including for her dissertation work.
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Mobile Voice:

A Feminist Strengths-Based Interpersonal Approach to Mobility Intervention

Introduction

Women increasingly comprise the poorest segment of American society and therefore are significantly more likely than men to have limited transportation access, yet transportation research and policy continually fail to recognize the unique needs and experiences of women (Blumenberg, 2000). Because women are concentrated in low-wage jobs and carry a disproportionate share of household responsibilities, women have very different needs and experiences of transportation than men (i.e., transporting dependents, safety concerns, chaining trips, complex travel, etc.) (Blumenberg, 2000). Homeless women, in particular, lack efficient and easy-to-utilize means of mobility needed to meet their daily needs and to cope with other problems related to homelessness (Patterson & Tweed, 2009). Access to efficient and easy-to-utilize transportation is a particularly important resource because it allows access to other important services and resources. For example, Wenzel, Leake, Andersen, and Gelberg (2001) observed that the lack of transportation to services was a primary barrier to access to birth control services among homeless women. Transportation access also has important implications for psychological outcomes such as stress and depressive mood (Ennis, Hobfoll, & Schröder, 2000).

Despite the implications for the material and psychosocial well-being of those with limited mobility, little to no research exists on how to intervene to improve the mobility of transportation-disadvantaged populations. Rather, existing research on mobility
interventions has tended to focus on “choice riders” of public transit (i.e., individuals who have access to a personal vehicle and therefore are not transit-dependent) (Bamberg, Rölle, & Weber, 2003). Lessons learned from research on choice riders can be supplemented with what descriptive research there is about the mobility of women in general and homeless women in particular as well as research on interventions with low-income women more broadly. Interventions to improve the ease and efficiency of transportation among any population, but particularly among populations with low access to transportation like homeless women, must target both the material barriers (i.e., cost, distance, etc.) experienced by these populations as well as the psycho-social and behavioral barriers (i.e., perceived control, stigma, exhaustion of social support resources, etc.) (Fletcher, Garasky, & Nielsen, 2005; Heath & Gifford, 2002; Lovejoy & Handy, 2007).

Specifically, mobility is inextricably linked both with one’s sense of control (Evans & Carrere, 1991; Groot & Steg, 2007; Lindquist, Lagory, & Ritchey, 1999; Schintler & Kaplan, 2000) and with one’s social support network and support mobilization (Carrasco, Hogan, Wellman, & Miller, 2008; Patterson & Tweed, 2009; Wolch, Rahimian, & Koegel, 1993). An intervention designed to improve individual mobility among homeless women may thus require two components: one to improve material access to transportation (i.e., via reducing costs) and another to empower women to maximize the ease and efficiency of their mobility via the mechanisms of increasing social support mobilization related to mobility and participant sense of control over their mobility. The current study is designed to examine the added value of a Mobile Voice intervention beyond providing women with bus passes. The
intervention uses the feminist-informed methodology of photovoice and a feminist conceptualization of relationship-based empowerment to spark group problem-solving related to mobility and social support mobilization.

**Defining Key Terms and Outcomes**

*Access.* Before exploring the ways in which inequalities in transportation access manifest in society, access must first be defined. Hine and Grieco (2003) defined access as the “get-at-ability” of a destination, but stressed that providing opportunities for access does not guarantee that people will take advantage of them. Many other factors influence access beyond just the material factors involved (cost, geography, etc). Hine and Grieco (2003) distinguished between direct accessibility and indirect accessibility. Direct accessibility refers to an individual’s ability to engage in travel-related activities through utilization of their *own* resources within their *own* limitations (Hine & Grieco, 2003). Indirect accessibility expands the idea of access to include an individual’s access to goods or services *via* social network members within the network members’ constraints (Hine & Grieco, 2003). This definition takes into account the “density of time” (i.e., multitasking, paying or asking others to undertake tasks on your account) more so than previous definitions of access (Hine & Grieco, 2003). However, Hine and Grieco (2003) did not address other factors influencing access, such as psychological, attitudinal, or cultural factors. They also did not acknowledge the need to account for suppressed journeys, i.e., not being able to take a journey that one needs/wants to take because of lack of the transportation to go there. Lewin (1951) stressed the various types of access that can be involved when examining human behavior in the
psychological ecological framework, including not only factors in the socio-ecological environment that affect access, but also psychological, cultural, and attitudinal factors. Two factors that determine the adequacy of transportation in facilitating access to other resources, are the ease and efficiency of transportation. Access to transportation alone is not adequate to meet one’s daily needs, but rather, one must have access to efficient and easy-to-utilize transportation in order to fully meet one’s needs.

**Efficiency.** Historically, the personal automobile has been associated with journey speed and ease of access, and the perceived speed advantage of the personal automobile continues to be a motivating factor for choosing the personal automobile over transit today (Hagman, 2006). Distance and duration of trips continues to be a common method of measuring transportation access, with some debate over whether traveling further and longer is better or worse. However, for those with limited access to transportation, lack of a personal vehicle has been found to contribute to time scarcity among disadvantaged populations, further limiting access to other services and contributing to other inequalities, such as those related to health (Peipins et al., 2011; Strazdins et al., 2011). Reliance on walking and public transportation among the transportation disadvantaged results in much longer journey times, including to emergency services like hospitals and other health providers (Hine, 2007).

Due to the additional time and space constraints on homeless populations as a result of limited transportation and the schedules of shelter life (e.g., having to leave early in the morning, not being able to be there during the day, and having to return by a strict curfew in
the evening), an ability to efficiently move from one location to another in order to access resources is particularly important (Wolch et al., 1993). Also, average journey length is hotly debated as a measure of transportation access because longer journey times can indicate both an ability to travel further (indicating greater transportation access), the need to go further in order to meet one’s needs (and therefore a disadvantage), or an inefficiency of travel due to slow modes of travel (a disadvantage). For example, women tend to make more trips, but men tend to travel further (Mitchell, 2011), and it has been unclear which of these aspects puts one at an advantage. Therefore, efficiency of travel, taking into account both distance and time, would be a better way to measure the extent to which one is at an advantage/disadvantage in their ability to use transportation to access resources. Duration of trip or distance of trip alone would not accurately reflect the adequacy of transportation or allow comparisons to be made that take both distance and time into account, but efficiency of travel could address both of these concerns. The current study uses efficiency of trip as an objective measure of access to adequate transportation.

**Ease.** Objective measures like distance and time get at one aspect of transportation access, but fail to address the more subjective aspects of an individual’s transportation experience, aspects that also affect one’s transportation-related behaviors and can affect the extent to which someone can access transportation in order to facilitate access to other resources. Bamberg et al. (2003) evaluated the extent to which the provision of a bus pass to new residents influenced their decision to use public transit over a car. They found that subjective factors were a stronger predictor of transit use than even past behavior or habit.
One way to address an individual’s subjective perceptions of their overall transportation experience is with a measure of ease versus difficulty of use. Bamberg et al. (2003) used an ease/difficulty measure in order to access participants’ perceived control in using transit. Blumenberg (2008) also used a subjective rating of ease versus difficulty of travel as a measure of transportation barriers for immigrants in southern California. The current study also uses an ease/difficulty of trip measure in order to assess the interventions’ effects on subjective perceptions of travel.

**Mobility Equity**

Events on the Gulf Coast during and following Hurricane Katrina highlighted not only the inadequacy of various aspects of U.S. infrastructure, but also how the burden of these inadequacies often fall along lines of race and class within our society (Rubin, 2006); one major area of infrastructure that is consistently funded in a way that results in differential access by race, class, gender, age, and ability, is that of transportation. Transportation access has been a target for advocacy for equality since the Freedom Rides in the 1960s, but this inequality did not end with the integration of the bus systems (Kirk, 2011).

Transportation research and policy have tended to ignore many of those most at a transportation disadvantage, including the women and the poor. Feminist standpoint theories argue for the need for research that addresses the specific needs of disadvantaged populations and brings their unique voice to the forefront. Feminist standpoint theories advocate that research go beyond simply acknowledging the bias of all research and knowledge in order to highlight issues of power and status. They also seek to place primacy on the experiences of
oppressed groups in order to provide a more complete understanding of social problems (Bond, Hill, Mulvey, & Terenzio, 2000a). The viewpoints of marginalized groups are particularly important in that individuals in these groups must maintain an understanding of their own view of reality as well as the way in which dominant groups view reality, and the relationship between these two views, in order to survive (Hill, Bond, Mulvey, & Terenzio, 2000b). Understanding the unique view, needs, and experiences of ignored and disadvantaged groups, like homeless women, will better enable researchers to intervene with them in order to remedy imbalances in access to needed resources, such as transportation.

This perspective is particularly important because research on homeless women in general, as well as on their mobility specifically, is highly limited. North and Smith (1993) noted a concern that homeless women are generally underrepresented in homelessness literature. Calsyn and Morse (1990) further noted the dearth of research on homeless women and how they differ from homeless men as well as the need for such research in order to address the needs of this population with interventions and public policy. This is particularly a problem in recent decades, when homeless women increasingly comprise homeless populations nationwide, and homeless women with children are the fastest growing subset of homeless individuals (Calsyn & Morse, 1990; Lewis, Anderson, & Gelberg, 2003; North & Smith, 1993). Blumenberg (1998) stressed the lack of attention given to women’s issues in local economic planning in the United States, even compared to developing countries, and advocated for, “an explicitly ‘gendered’ focus” to be inserted in local economic development (p. 131). Johnson and Crum-Cano (2011) noted the absence of women in urban planning
governmental positions and its contribution to the invisibility of women in transportation research and planning. Research on the mobility of the homeless, particularly homeless women, is highly limited (Wolch et al., 1993). Wolch et al. (1993) observed the importance of this research in understanding the extent to which homeless individuals cope with their situation and how they obtain needed services. The current study sought to address these gaps in the literature by synthesizing what research does exist related to the mobility of homeless women and apply it to the measurement of and intervention in the mobility of homeless women in a way that accurately represents their experiences.

From the perspective of community psychology, differential access to resources necessary for well-being is an issue of justice. Prilleltensky (2011) provided an overview of the relationship between wellness and justice from a community psychology perspective, stressing that optimal conditions of justice are necessary to promote psychological conditions of thriving, whereas suboptimal conditions of justice can result in psychological conditions ranging from coping to suffering. Transportation is a resource critical to well-being and is unequally distributed along lines of income, sex, age (both youth and seniors), and ability (those individuals with various forms of disabilities that make driving difficult), all groups with lower levels of access to personal vehicles who must depend primarily on public transit and/or walking to access important resources and destinations (Hine & Grieco, 2003). The current study focused on inequalities at the intersection of income and gender due to the effect of this intersection on transportation needs and experiences.
**Income.** The poor spend a disproportionately large share of their income on transportation. The cost burden for commuting to work for the working poor in the United States is 6.1% of income, but only 3.8% of income for other workers. The working poor who *drive* to work have the largest cost burden at 8.4% of income (Roberto, 2008). Housing and transportation costs combined are more of a burden to the working poor than to other households, with almost 25% of household income of the working poor spent on housing and commuting, compared to 15.3% in other households (Roberto, 2008). Housing and transportation are linked, as many households engage in a “trade-off” between cheaper housing and a longer commute (Roberto, 2008). According to Hine and Grieco (2003), in the UK, a country with much greater public transportation infrastructure, transportation disparities by income category still pervade. Low income households tended to make fewer overall trips, yet twice as many journeys by foot and three times as many journeys by bus as those in the highest income levels. Overall, car-less populations tended to have significantly longer journey times than those with cars (Hine, 2007).

**Gender.** Because women earn lower wages than men on average and are more likely than men to be living in poverty, issues that affect the poor disproportionately affect women (Blumenberg, 1998). In research with low-income women, Blumenberg (2004) notes that low-income women make more trips overall and make a higher percentage of household-serving trips than low income men, with work trips comprising only 18% of total trips made for low-income women of working age. Women are also more likely to trip-chain (making stops between) on their way to and from work (Blumenberg, 2004). Women’s commutes
also tend to be shorter than men’s due to a propensity to stay closer to home in order to facilitate domestic responsibilities, with women’s average commute at 8.1 miles, which is 77% of men’s commute distance (Ong & Blumenberg, 1998). Similarly, although both men and women in the UK have been found to be more likely to travel by car than by other modes, men were more likely to use cars than women, and women were more likely to walk or take public transport than men (Hine & Grieco, 2003). Men tended to have greater access to a car on average than did women and also therefore were able to access key destinations more quickly than women (Hine, 2007). Hine and Grieco (2003) noted that in the UK men made about 4% more journeys per person per year than did women, but men traveled 45% further on average.

Homeless women, in particular, are affected by inequalities along the lines of income and gender, but also overlap with other areas of disadvantage, including ability and age, with both older people and people with disabilities more likely to use public transportation in part because car use is limited (Hine & Grieco, 2003). All of these factors make the unique transportation needs and experiences of women experiencing homelessness an important yet under-researched area of study.

**Outcomes of Mobility**

Inequality in transportation access matters because access to transportation is related to access to other important resources and to other important aspects of well-being. Previous literature has examined the connection between transportation disadvantage and social exclusion, with inability to access transportation resulting in an inability to access goods and
Mobile Voice

services more generally (Cass, Shove, & Urry, 2005; Freund & Martin, 2007; Hine & Grieco, 2003; Hine, 2007; Rajé, 2007). Limited access to transportation also contributes to time scarcity among disadvantaged populations, further limiting access to other services and contributing to other inequalities, such as those related to health (Strazdins et al., 2011). Reliance on walking and public transportation among the transportation disadvantaged results in much longer journey times, including to emergency services like hospitals and other health providers (Hine, 2007).

Among homeless women specifically, Patterson and Tweed (2009) noted instrumental support from others, such as through the provision of transportation, as a primary facilitator of escape from homelessness. When participants in Patterson and Tweed’s (2009) survey of homeless individuals were asked to rate the extent to which they needed different supports to move toward greater independence and self-sufficiency, transportation was rated fifth out of 25 “helps” for escaping homelessness among currently homeless participants and was rated ninth out of 25 among participants previously homeless. Wolch et al. (1993) suggested that the daily mobility of homeless individuals is positively related to successful coping, as a prerequisite for accessing various needed services and social support. The extent to which ease and efficiency of access to transportation also contributes to differential access to these other resources illustrates the importance of further exploring the mobility experiences of homeless women and potential means of intervention to increase the ease and efficiency of their daily travel. Previous research on the unique
travel needs and experiences of women and the homeless provided some insight for the current study.

**Different Needs, Different Experiences**

Although little research exists on how to intervene in the mobility of transportation-disadvantaged populations, there is some research that describes how women, and homeless women specifically, experience their mobility. Homeless women fall at the intersection of various subpopulations often ignored by relevant bodies of literature and related policies, women and the poor. The transportation needs and experiences of women significantly differ from those of men in many ways and therefore cannot be subsumed under the idea of a universal transportation experience, predicated on the male experience of transportation. Similarly, the unique transportation needs and experiences of the homeless are rarely addressed in transportation literature, and little research specific to transportation exists in the homelessness literature. Again, the transportation experiences of the homeless cannot be assumed to fit within a characterization of mobility based upon homed populations. Finally, the unique needs and experiences of homeless women are just beginning to be addressed in homelessness literature. Although their experiences have also often been subsumed under the needs and experiences of homeless men, a growing body of research on homeless women specifically reveals the ways in which they differ significantly from homeless men. The current study drew upon what literature there is on the transportation needs of women more generally and homeless women specifically in order to construct the current intervention.
Women’s Travel. Overall, women tend to have transportation needs and experiences different from those of men. For example, factors that make women’s transport unique from that of men include differences in patterns of travel, patterns of employment, income, caregiver responsibilities, and access to different modes of travel, as compared to men (i.e., less access to personal vehicles and less “fit” with public transportation infrastructure due planning based upon a traditional male commuter model) (Hine & Grieco, 2003; Lopata, 1980). Women are more likely to have multiple roles and primary responsibility for caregiving and domestic work, resulting in more complex daily travel needs. Women have more constrained employment opportunities and are more likely to be in part-time and/or casual employment, often limiting the geographical extent of their potential employment options based upon fit with domestic responsibilities and fit with the transportation available to balance these responsibilities (Kurz, 2000; Lopata, 1980).

Overall, women’s travel is more likely to be contained close to home in order to achieve balance between the responsibilities of work and home, including childcare, perhaps due to inadequate means of transportation to travel farther and faster. Safety is more of a concern for women travelers (Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001; Emerson & Gardner, 1997; Hine & Grieco, 2003). Women tend to travel for different purposes than men, taking more family members to destinations, taking more shopping trips (Kurz, 2000; Lopata, 1980), but making fewer trips to pubs, clubs, and sporting events than men (Hine & Grieco, 2003). Furthermore, women are more likely to travel during off-peak times, but travel less after dark in comparison to men (Hine & Grieco, 2003).
Women in the US and in other Western countries have also consistently been found to have more complex travel patterns than men. Women are more likely to make “interconnected decisions” about the location of work and the need to transport children (Lopata, 1980), and women are more likely to trip-chain (i.e., go to multiple destinations in one outing before returning home), in part due to the added burden/restrictions on their time as a result of their additional responsibilities (Hine & Grieco, 2003; Rosenbloom & Burns, 1994).

Finally, women are more likely to walk to work, possibly due to a lack of adequate transport alternatives, and the complexity of women’s travel needs can result in a mismatch with public transit, which can make complicated trip chaining impossible and/or fail to match with personal schedules (Blumenberg, 2000; Hine & Grieco, 2003; Preston & McLafferty, 1999; Schintler & Kaplan, 2000). Older women, disabled women, minority women, and women with dependents have particularly unique and pressing transportation needs due to less access to personal vehicles and greater complexity of travel (Hine & Grieco, 2003). The complexity of women’s travel illustrates the extent to which material as well as psychosocial factors have important implications for women’s travel decisions and that this complexity must be accounted for when intervening in and/or evaluating women’s mobility.

Homeless Women’s Travel. As for anyone, the mobility needs of individual homeless persons depend on their various personal characteristics and vulnerabilities (abilities, values, perceptions, social roles), and these characteristics shape coping and survival needs (Wolch
et al., 1993), all of which can vary systematically between homeless men and homeless women as well as among homeless women.

It is important to recognize that homeless women have different needs and experiences than homeless men in general, indicating potential areas of differential transportation needs (North & Smith, 1993). Previous research comparing homeless men and homeless women has found that homeless women, in comparison to homeless men, are more likely to be younger, to be members of a minority group, to have children with them, to be unemployed, to be dependent upon welfare, to have been homeless for a shorter period of time, to not have been incarcerated, and to not have a substance abuse problem (North & Smith, 1993).

These differences are reflected in their mobility needs and experiences. For example, homeless women were more likely to have been living in the homes of their family members before homelessness and to have family members that currently refused contact with them. In these situations, the extreme and continued need of the homeless individual may result in conflict and strained relationships among social network members to the point of those network members no longer being willing to provide assistance, including transportation (North & Smith, 1993). Rowe and Wolch (1990) noted the significance of social networks in shaping the mobility of homeless women. That homeless women are more likely to depend on social networks for transportation and more likely to have severed ties with social network members illustrates the importance of how homeless women’s overall differences from homeless men can have important implications for their mobility.
Homeless women differ systematically amongst themselves as well (North & Smith, 1993). Differences among homeless women are often categorized by whether a woman is solitary or has children with her, with solitary women more likely to be White, homeless longer, and more likely to have a history of alcoholism or schizophrenia than women with children (North & Smith, 1993). These differences could greatly affect services needed as well as the logistics of travel. Due to the interrelationship between domestic responsibilities and mobility needs and behaviors, the distinctions between these two groups of women are relevant to mobility concerns. The ways in which homeless women differ from one another, homeless men and/or homed women have important implications for interventions designed to meet the needs of homeless women (North & Smith, 1993).

The mobility of homeless individuals also depends upon the surrounding environment and the location and availability of various needed resources and the larger societal context of homelessness according to current policy, funding, etc. (Wolch et al., 1993). Transportation is an important resource for homeless individuals and is also a difficult resource to access (Acosta & Toro, 2000). The mobility of the homeless is constrained by several factors, most outside of their immediate control, and can be both voluntary and involuntary, such as access to transportation modes, shelter schedules, and forced migration by law enforcement (Wolch et al., 1993). Mobility paths are subject to “severe time-space constraints of almost every type” (Wolch et al., 1993, p. 163), including primarily walking to destinations, receiving bus tokens from agencies subject to proof of critical appointments, the time routine of shelter life, and a social role that could restrict movement (mother/spouse).
Previous interventions by the current researcher at the site of the current study also indicated that homeless individuals may find themselves in a mobility paradox, alternating between periods of extreme mobility (having to move from place to place to access housing and other resources) and immobility (not being able to move from place to place due to lack of transportation access to meet day-to-day needs), both of which occur outside of their own control, leaving them perpetually outside of their own desired state of mobility. All of these factors influencing the daily needs, experiences, and travel of homeless women are important to take into account when designing evaluations of or interventions in their mobility.

**Transportation Outcome Measures for Complex Experiences**

The current study sought to develop and evaluate an intervention designed to improve the ease and efficiency of participants’ day-to-day. Ease and efficiency of trips as recorded by a daily trip diary served as outcomes for the current study that accounted for the complexity of travel among homeless women and the mobile nature of the phenomena under study. These outcomes allow for a meaningful and measurable mobility outcome, going beyond traditional conceptualizations of improving mobility as “more is better,” acknowledging that more access does not always require more trips (Flamm & Kaufmann, 2006). In contrast, the ease and efficiency of trips examines the quality of participant experience of travel, not just the amount of travel, as a measure of access to adequate mobility resources.

A wide range of ways to measure mobility and/or transportation access exists in the various threads of transportation-related research. Although the current study drew upon
each of these bodies of research, any one singular methodology and means of measuring mobility is inadequate for fully capturing the experiences of this population for the purposes of the current study. Therefore the current study was situated at the intersection of these literatures, critiquing and drawing upon them where necessary, in order to find the ideal methodology and mobility outcomes for the specific subpopulation in this study.

Transport. One relevant thread of research is traditional transport literature. Traditional transport research has often assumed a universal experience of transportation technologies, and therefore research on the mobility of disadvantaged groups is limited. Transportation policy has often been based upon the results of large household travel surveys (HTS). The goal of household travel surveys is to provide a general or universal description of the travel behaviors of a population in order to project infrastructure needs into the future. For example, in traditional transport literature, large extant geographically-based data sets have often been used to determine the extent a region or geographic area has access to the transportation necessary to access various needed services (e.g., Van Acker, Witlox, & Van Wee, 2007). Such methods lack the sensitivity necessary to reflect complex travel behaviors and promote the idea of a universal transportation experience rather than preserving the diversity of transportation experiences among different groups, particularly the transportation disadvantaged, which tend to be under-represented in such surveys.

Research that targets and accurately reflects the needs and experiences of particular subsets of the population is important because the mobility of various disadvantaged groups is complex and both differs and overlaps with that of other populations; their mobility cannot
be subsumed under the patterns of the “universal” conceptualization of mobility. Rajé (2007) stressed the need for transport research and policy to take into account the unique contexts of specific populations in specific localities. The larger surveys of traditional transport literature tend to under-sample the transport-disadvantaged due, in part, to the cost and difficulty of reaching these populations; for this reason, alternative sampling techniques are necessary to reach these groups (Delbosc & Currie, 2010). Feminist geography is one area of research that has attempted to describe the transportation experiences of women specifically.

*Feminist Geography.* Feminist geography is another strain of research that has emerged to address the specific transportation needs and experiences of women and includes both women-and-transport and welfare-to-work literatures. Although this strain of research has moved beyond the idea of a universal mobility, stressing the inequalities between men and women’s travel, the literature continues to use the inadequate methods and measures of traditional transport literature, drawing upon large extant data sources, despite focusing more on disadvantaged populations (e.g., Blumenberg & Shiki, 2003; Cervero, Sandoval, & Landis, 2002).

A commonly used measure of transportation access in the feminist geography literature has been level of access to a personal vehicle (e.g., Blumenberg, 2008; Ong, 1996). This approach to measuring mobility often provides categorical rather than continuous response options, greatly limiting the variability of responses. Another approach to measuring access to a personal vehicle uses number of trips taken by car in a given period of time (Blumenberg, 2000; Preston & McLafferty, 1999; Rosenbloom & Burns, 1994).
Although this type of measure is continuous, such measures have lacked sensitivity to the transportation experiences of the severely transportation-disadvantaged, such as homeless women, who seldom have any access to a personal vehicle or who use their car in different ways as compared to a homed individual—such as using a car as shelter. Such measures have not allowed for the complexity of daily travel, but rather have reduced this complexity to a one-time aggregate response. Finally, measures that base mobility on number of trips alone ignore the possibility of choosing to be immobile and/or being forced to be mobile. Making more trips, or even more trips by car, does not necessarily result in more needs met more effectively or a better quality of life. The mobilities paradigm begins to address some of these issues.

*Mobilities.* Another thread of research, mobilities, has emerged out of a critique that traditional social science research has often ignored the increasingly mobile nature of social phenomena and the ways in which developments in transportation and communication technology have affected such social phenomena. Mobilities research seeks to examine mobile phenomena and how they have influenced our society. Mobilities research explores the ways in which the movement of people and goods affects individuals’ lives and societal phenomena (Hannam, Sheller, & Urry, 2006).

This new approach also generates a need to reexamine theory, methods, and analyses in a way that does not presume stasis. For example, with the intended sample for the current study, theory, methods, and analyses must take the transient nature of the population and mobile nature of their activities into account rather than rely on traditional approaches which
may assume a certain level of stability or assume a home base as a norm. However, mobilities research also often fails to account for the ways in which such advances in technology affect different populations differently and often perpetuate inequality. Some scholars in this field have begun to address these issues at length, and their work provides valuable resources from which to draw when examining issues of transportation access among disadvantaged populations. For example, Sheller and Urry (2000) explored the ways in which the personal automobile has affected our society and the inequalities that pervade it. A growing body of mobility research provides the theoretical basis for examining the ways in which transportation access perpetuates social exclusion as well as for potential innovative methodologies that could target difficult-to-reach populations and measure mobile phenomenon “on the move” (Buscher, Urry, & Witchger, 2011; Cass et al., 2005; Urry, 2004).

Rather than operationalizing mobility, Flamm and Kaufmann (2006) proposed the concept of *motility*, defined as the capacity to be mobile. This definition recognizes that a conceptualization of mobility based upon the number of trips taken or distance traveled did not capture the issue of choice in mobility. A person may be fully able to be mobile and have adequate access to the transportation necessary to get where he or she needs to go. Yet, if a person does not travel because she lacks the desire or need to travel, yet still has the capacity to be mobile if she chooses, she is not at a mobility disadvantage. Conversely, particularly for homeless women and other transportation-disadvantaged, mobility can sometimes be forced, with individuals having to move when they do *not* wish to move. The idea of
motility provides a way of conceptualizing one’s potential mobility, or the extent to which one can choose to be mobile. Ureta (2008) explores the ways in which motility can be a tool through which to analyze social exclusion, with those with less motility being more likely to be socially excluded, including often the homeless. However, motility has yet to be operationalized into a measurable construct.

Therefore, the current study sought to synthesize lessons learned from the various relevant literatures in a way that resulted in a method and measures best equipped to capture the experiences of the current sample. These methods sought not to subsume the experiences of the current sample under a universal mobility and therefore not to use measures designed to measure a universal mobility. Measures must be sensitive to the complex nature of this sample, and methods must allow for participant experiences to be gathered “on the move” in order to reflect the mobile nature of the phenomena of interest. Furthermore, measures cannot be rooted in the assumption that “more is better,” but rather must seek to capture participant perceptions of overall mobility satisfaction (whether this means traveling or not traveling when they want to).

*Trip Diaries.* Research on the mobility of transportation-disadvantaged populations, like homeless women, must employ both a theoretical framework and innovative methods and measures that are capable of adequately capturing and intervening in the unique and complex needs and experiences of these populations. Axhausen, Zimmermann, Schonfelder, Rindsfuser, and Haupt (2002) noted the trend in transport literature to use trip diaries in order to capture the constantly changing nature of travel, composed of both learning and change as
well as rhythms and routines. Trip diaries enable the collection of a wealth of complex information to be collected for each trip taken by participants as they are “on the move.”

Previous literature has made use of travel diaries as a method in order to collect highly varied information about daily travel. Blumenberg (2008) used an abbreviated travel diary in her study of transport barriers to employment among immigrants in southern California. The diary asked respondents to describe the first five trips they took on the day previous to the day of the survey, including their destinations and travel modes. Jocoy and Del Casino (2008) used a similar travel diary measure that asked respondents to list their daily travel activity on the day before the survey was administered. Addresses from the travel diaries were geocoded and used to calculate the network distances traveled for each respondent throughout the course of one day (based upon the least cost path between each stop traveled along existing roads, which may or may not match actual route taken). Data from the travel diary enables comparisons of total miles traveled and total geographical extent covered, as well as general patterns of travel, across groups and individuals.

Bamberg, Rölle, and Weber (2003) used a one-day mobility diary to assess “actual behavior,” consisting of a booklet with a page for each trip on a specified day on which participants noted the time, starting location, purpose, travel mode, destination, time of arrival, and estimated distance for each trip. Mobility diary data were used to compare modal choice pre- and post-intervention using modal proportions. In their Mobi\textit{drive} study, Axhausен et al. (2002) used a six-week travel diary in order to analyze the “rhythms in the behavior of the respondents” (p. I). Trip diary contents included day of trip, starting time,
purpose, modes used, accompanying persons, presence of a dog, exact destination, activity costs, expenditures on travel, arrival time, and estimated distance travelled (Axhausen et al., 2002). Ways such data can be used in analyses includes examining “mobile days” versus “immobile days,” average number of trips or journeys per day, average trip length or duration, and comparisons of trip dimensions (such as purpose and mode) and one can control for day of the week and weather if desired. Travel diaries have been increasingly becoming part of more comprehensive household activity scheduling data, much of which is being collected via related software programs (Doherty & Miller, 2000; Ettema, Borgers, & Timmermans, 1996).

Trip diaries are a common research tool used to account for the complexity of daily travel without reducing it to categorical responses or aggregate scores or being as subject to retrospective reporting bias. The current study therefore used trip diaries as a form of mobile collection methods in order to collect data on trip ease and efficiency as participants are “on the move.” The Mobile Voice intervention was designed to have a greater effect on both trip ease and trip efficiency, as measured by travel diaries, than the provision of a bus pass alone.

**Previous Approaches to Intervention**

Little attention has been given in the literature about how to improve the efficiency and ease-of-utilization of daily travel among homeless women. Most research on changing transportation behavior that does exist surrounds issues of “choice riders,” or those who have access to a personal vehicle, and how best to influence them to choose transit (Groot & Steg, 2007). For example, Groot and Steg (2007) used the Theory of Planned Behavior to attempt
to explain participants’ intention to use a park-and-ride center in The Netherlands. The Theory of Planned Behavior contends that attitudes, subjective norms, and perceived behavioral control combine to determine behavioral intention. The extent to which any one aspect of these factors predicts transportation use and choice varies by population and travel behavior. For example, the car is often associated with many advantages over public transportation, such as freedom, comfort, status, and convenience, but these attitudes may be less of a predictor of transit use for individuals with strong environmentalist beliefs and attitudes (Groot & Steg, 2007). However, this theory fails to account for more material factors such as cost or distance. Also, the Groot and Steg (2007) study examined employees and shoppers, limiting its generalizability to other populations, such as those disadvantaged populations with little access to employment or the money necessary to shop. One limitation that Groot and Steg (2007) mentioned is that their study did not account for cost of parking, a concern that would either be even greater or would be completely non-applicable for low-income populations.

Groot and Steg (2007) suggested that future interventions address attitudes, subjective norms, perceived control, particularly egoistic concerns (i.e. how a certain mode of transportation affects one’s image/status), and direct individual advantages of certain types of travel. This model could be useful in predicting travel behaviors in any population, but much more useful with transportation-disadvantaged populations if it also included material facilitators and barriers to transportation choice/intention to use. Bamberg, Rölle, and Weber (2003) assessed the impacts of an intervention that provided a transit pass and information on
transit to recently relocated residents on whether choice riders would begin to choose transit more than their personal vehicles, finding that the intervention affected attitude, subjective norm, and perceived behavior control. These subjective and attitudinal factors were a greater predictor of the effect of the intervention than even previous behavior and habits.

Even low-income individuals without access to a car still have a choice as to whether they will ride public transit or not, and this choice may or may not be shaped by different factors than traditional “choice riders.” For example, Hine and Grieco (2003) noted that, in the UK, people who live in households without cars used public transport for 25% of their journeys, seven times more than those in households with cars. However, taxi use and minicab use were also higher among non-car-owning households, demonstrating that these individuals were still making public transit choices on more than just cost. Interviews with clients and staff at the site of the current study confirmed similar trends of choosing to pay much more money for rides or taxis, often at high personal cost, rather than ride public transit. Yet cost was still more of a determining factor for low-income individuals’ choice to use public transit, with non-car-owning households in the lowest income bracket in the UK making 60% of all journeys by foot (Hine & Grieco, 2003). Previous interviews with staff and clients of the site of the current study also confirmed the large role that cost plays as a deterrent to public transit use among that sample.

Another example of a transportation-related intervention is the evaluation of a “travel remedy kit” intervention designed to make substantive improvements in the experience of transport journeys (Watts & Lyons, 2011). Watts and Lyons (2011) did not just view the
journey as a means to an end to be minimized, but rather as a productive and experiential
time of transition between places. This intervention sought to create active participants
rather than passive travelers through efforts to alter passenger behavior, resulting in the
“making” of travel time rather than just the saving of travel time. Similar approaches to
empowering individuals within existing travel constraints through equipping them with
knowledge and skills could be useful for the Mobile Voice intervention. However, material
barriers, such as cost, are not addressed by the travel remedy kit intervention. An approach
that simultaneously equips individuals to meet the demands of the transport environment
while also attempting to address the material barriers to transit use would be ideal.

Furthermore, this approach fails to engage participants in first exploring barriers within
their current transportation experiences or in the construction of new means for improving
their transportation experiences, prescribing solutions without consulting participants. This
literature on mobility-related interventions provides some insight into intervening in mobility
in general, but fails to take into account the unique challenges of the transportation
disadvantaged. Because little literature exists on intervening in the mobility of mobility
disadvantaged populations specifically, descriptive literature on the barriers and facilitators
to the mobility of these populations can be helpful in filling gaps in the intervention literature
in order to construct an intervention to improve the mobility of a specific transportation-
disadvantaged subpopulation.
Barriers and Facilitators of Mobility

Research on intervening with non-choice riders is limited, but research does indicate potential barriers/facilitators to travel among disadvantaged populations. An intervention to improve mobility of non-choice riders could seek to reduce these barriers and/or capitalize on these facilitators, integrating these mechanisms with previous methods of intervention with choice-riders. The following factors – cost, control, and social support networks – have been found to be important factors in the transportation access of transportation disadvantaged populations, particularly homeless women. The current study draws upon the interrelationships between mobility, affordability, control and social support in the design and evaluation of the Mobile Voice intervention.

Cost/Affordability. Wolch et al. (1993) suggested that the relationship between daily mobility and successful coping could be facilitated by the subsidization of urban transportation costs for the homeless through the provision of low/no-cost bus passes. Hine (2007) also noted fares as a primary issue for bus users. Many homeless individuals walk because bus tokens are difficult to obtain either due to cost or because of agency restrictions on how to receive one (Wolch et al., 1993). Interviews at the site of the current study confirmed the barrier that cost can be to riding local public transportation options. This barrier was addressed in the Mobile Voice intervention via the provision of bus passes to eliminate the cost of transit use.

Control. Perceived control over one’s mobility is interrelated with transportation use and behavior in various ways. Personal control theories focus an individual’s perceived control
over life events as a predictor of well-being (Wills, 1985). This could relate to locus of control, self-efficacy, and/or control over events, and therefore would be the opposite of perceived helplessness (Wills, 1985). The ways in which one’s individual sense of control over mobility interacts with constraints on mobility that rest outside of the individual is a key relationship targeted by the Mobile Voice intervention. Mobility and control are reciprocally related. Adequate access to mobility gives individuals a greater sense of control over their mobility and their lives in general, and, conversely, a greater sense of control over one’s daily mobility is associated with greater access to transportation resources and to the needed destinations these resources facilitate.

The extent to which one can access needed resources with existing transportation resources, such as social network members, can be affected by one’s sense of control, with one’s agency sometimes capable of mitigating spatial barriers. Timko and Moos (1989) observed among a sample of aging participants, that greater perceived choice, control, and independence resulted in greater use of services in general. Carrasco, Hogan, Wellman, and Miller (2008) explored the ways in which propensity to travel to access social networks is shaped by two factors: agency – an individual’s will to initiate events with members of their social network – and social accessibility – a series of practical constraints for social-activity travel. Results indicated that the greater the practical barriers to access (such as distance), the more important agency becomes. The further you live from your social network members, the more individual agency in maintaining those ties is necessary (Carrasco et al., 2008). A higher perceived control among homeless individuals has also been found to be
related to adaptability to one’s environment. Lindquist, Lagory, and Ritchey (1999) observed that, among migrant homeless individuals, those with a strong sense of control over their surroundings and trust in their own problem-solving abilities are better able to adapt to new environments. All of these instances illustrate the ways in which one’s perceived control can help one to cope with environmental constraints.

Control and mobility are also related in that material constraints within the environment can limit one’s sense of control over their environment. For example, different modes of transportation can be associated with different perceived levels of control. Groot and Steg (2007) noted that personal vehicles in comparison to public transport are associated with a sense of freedom, social status, convenience, and comfort. Ellaway, Macintyre, Hiscock, and Kearns (2003) found that participants who drove a personal vehicle regularly rather than using public transportation, demonstrated higher feelings of autonomy, protection, mastery, prestige, and self-esteem. Schintler and Kaplan (2000) noted that participants who were provided with a car demonstrated improved self-esteem, sense of independence and control, and overall mental well-being. However, particularly among disadvantaged populations, car access cannot be seen as simply dichotomous (full access or no access), but may depend on various other factors such as fuel affordability or who in the household has access.

Other material conditions associated with one’s transportation experiences, such as traffic congestion, can have an impact on one’s sense of control. In a study of bus drivers in urban centers, Evans and Carrere (1991) found that higher traffic congestion decreased
drivers’ perceived control on the job. Perceived control can also result from variations in convenience, predictability, stigma, and safety. Hine (2007) noted availability of services, weather, convenience, access to information, and safety concerns as primary issues for bus users, all of which related to the level of control a person has over their transportation experience with a bus.

Finally, perceived control can mediate between (perceived) environment and psychological or behavioral outcomes as well as predict transportation use. As noted above, Evans and Carrere (1991) examined the relationship between traffic congestion, perceived control, and stress and found that the relationship between traffic congestion and stress was mediated by perceived control. Novaco, Stokols, Campbell, and Stokols, (1979) also found that travel impedance predicted a cluster of stress indices, including physiological (as measured by blood pressure), negative mood, and task performance, but its effect was mediated by locus of control. Furthermore, perceived control has been found to predict use of various transportation modes. Factors that predict car use (over public transit) include journey time concerns, journey-based affect, effort minimization, personal space concerns, monetary costs, and underlying desire for control (Gardner & Abraham, 2007). Groot and Steg (2007) found that the perceived control associated with the personal vehicle (as noted above) was able to override positive attitudes or intentions towards use of public transportation, resulting in continued use of the personal vehicle. Perceived behavior control also has been found to mediate the relationship between perceived walkability of one’s
environment and travel behavior (i.e. walking) (McCormack, Spence, Berry, & Doyle-Baker, 2009).

Mobility and control are interrelated in numerous ways. Perceived control is both predicted by various environmental constraints, and also can mitigate the effects of such constraints on both travel-related behavior and other psychosocial outcomes. Therefore the Mobile Voice intervention targets participants’ sense of control over their mobility as a mechanism for improving the ease and efficiency of participants’ daily travel.

**Social Support.** Social support is another factor found to be interrelated with transportation access and access to other needed resources. Social support includes any resources (emotional, informational, material, etc) provided by other people that could be useful to an individual in coping (Cohen & Syme, 1985; Schwarzer & Buchwald, 2004). Research on the extent to which homeless individuals have access to social support is mixed, but evidence suggests that many homeless individuals do have strong social ties with both homed and homeless network members (Lindquist et al., 1999). Previous research suggests that the relationship between social networks and mobility is reciprocal, with homeless individuals using their mobility to access social network members, and social network members then in turn providing necessary resources, including transportation resources (Lindquist et al., 1999; Wolch et al., 1993).

Transportation is often noted as one way that instrumental social support can be given or received (Hogan, Linden, & Najarian, 2002). MacDonald and Grieco (2007) noted the reciprocal relationship between social support and mobility in that one’s mobility can shape
one’s access to and therefore formation of social networks, and one’s social network member locations can drive one’s mobility patterns. In a study of Iowa families, availability of transportation assistance from someone outside the household was found to be a significant predictor of whether a family experienced transportation hardship or not (Fletcher et al., 2005). Rajé (2007) found that despite people’s perceptions that their transport experiences were fairly autonomous, in reality they were making considerable use of social help structures in order to accomplish their daily travel, including giving rides, exchange of travel, combining trips with others, and reliance on others. Particularly among low-income individuals, Rajé (2007) noted evidence that individuals tend to cope with their lack of financial capital by relying on social capital in regard to their transportation needs.

Often services for individuals who are homeless are geographically separated from their social support networks, making staying in touch with network members difficult without access to communication and transportation resources (i.e., phone or transit), illustrating the need to provide basic transportation resources in order to facilitate social support (Toohey, Shinn, & Weitzman, 2004). Rowe and Wolch (1990) observed how homeless women shaped their daily mobility according to the locations of their social network members in order to cope with their circumstances. Access to mobility as well as patterns of mobility were shaped by the extent to which an individual had access to a social network and where those network members lived in relation to other needed services (Wolch et al., 1993). The only factors examined that significantly predicted differences between mobile and nonmobile participants were related to social support networks, with the mobile
more likely to have stayed with family and friends, more frequently in contact with families, and more likely to have received food from family members in the last year (Wolch et al., 1993).

Both homed and unhomed social network members can facilitate successful coping among homeless individuals, with homed network members providing needed resources and homeless network members dividing labor among themselves, splitting up daily tasks and pooling collective resources (Wolch et al., 1993). Homeless individuals utilize their social networks in order to facilitate successful coping through resource sharing (Wolch et al., 1993). Social networks both facilitate daily mobility via resource–sharing that enables mobility (such as by providing money or transportation) as well as generate daily mobility because homeless individuals will move throughout town in order to meet social ties that will provide assistance. Hine and Grieco (2003) stressed that individuals in low-income households tend to compensate for their lack of income by relying on social support to assist in meeting survival needs. Low-income individuals tend to borrow time between households for tasks such as shopping and childcare, compensating for low levels of direct accessibility with social support which provides indirect accessibility (Hine & Grieco, 2003).

Transportation can also be one of many needs/resources used to form networks of reciprocity among social support members. Nelson (2000) found that low-income single mothers tended to share a variety of resources, transportation among them, as a form of exchange. Furthermore, although these relationships of exchange exist among low-income single mothers (a peer group with more equal access to resources), relationships between
low-income single mothers and those in their networks with higher incomes than them were mixed. With their more fortunate network members, low-income single mothers were found to be more likely to exhibit dependence when it came to concrete resources and more likely to exhibit reciprocity in exchange of more abstract resources, such as through gratitude, emotion support, and loyalty (Nelson, 2000). Jirón (2011) discussed at length the importance of social networks and the need to establish “co-presence” with social network members, though the complex logistics of doing so is not addressed.

Social networks can even make up for lack of financial capital by providing alternative modes of mobility such as ride-sharing. The work of Carrasco et al. (2008) sought to operationalize individual agency in reaching their social networks within the constraints of their environment as well as the extent and characteristics of their social networks. The “agency perspective” taken by Carrasco et al. (2008) attempted to locate an individual’s travel behavior and decision making within an individual’s social context, including their social networks, the tools to maintain awareness of the network (email, phone), and constraints on behavior (location, obligations, characteristics, social structural attributes). This agency perspective shapes the “social network approach” in which one’s social activity is not constant or static, but rather shifts based upon one’s past engagements and future expectations (Carrasco et al., 2008). This approach to social networks and how they may shape activity-travel is a useful approach when merged with the distinction between direct and indirect access in that social network members can serve as indirect links to mobility resources (Hine & Grieco, 2003). The Mobile Voice intervention attempts to
target participants’ mobilization of social network members as linkages to transportation resources in order to improve participant access to mobility and therefore ease and efficiency.

Social Support and Control. Finally, control and social support are highly linked to one another. Hogan et al. (2002) observed that instrumental social support relates to a decreased feeling of loss of control. Control theorists would see the benefits of social support as stemming from the way in which social support provides a boon to feelings of control during crisis due to the stability resulting from provided support (Wills, 1985). Two types of social support are believed to be more related to perceptions of control. Informational support can reduce confusion and provide coping strategies through providing information or advice, whereas instrumental support can improve a person’s sense of control by providing material resources (Hogan et al., 2002). Being embedded in social networks and the feedback received as a result reduces feelings of uncertainty and improves perceived control (Cohen & Syme, 1985). Nyamathi et al. (2000) noted engendering feelings of personal efficacy as among the observed benefits of social support. Rajé (2007) noted that although transportation-users perceive their transportation decisions as autonomous, in reality, users relied heavily upon social networks in making these decisions.

The current study draws upon the interrelationships between mobility, affordability, control and social support in the design and evaluation of the Mobile Voice intervention.

The Current Study

The current study compares two approaches to increasing mobility: (1) an intervention that provides a bus pass to minimize the cost of public transportation, therefore
reducing a material barrier to participant mobility, and (2) an intervention that provides a bus pass with the additional component of a Mobile Voice intervention that seeks to facilitate a sense of control over mobility and the mobilization of social support networks, both in order to facilitate the ease and efficiency of daily travel. The Mobile Voice intervention and accompanying evaluation draws upon the theoretical traditions of community ecological psychology and feminist theories in order to define the problem, intervene in the problem, and evaluate the intervention.

Theoretical Perspective of the Current Study

*The Ecological Context.* Community psychology holds an ecological perspective at the forefront of all research designed to measure or intervene in behavioral phenomena. For transportation access, the ecological environment is particularly important, with the larger sociopolitical and historical contexts to a large extent determining local sociopolitical contexts and the local built environment, and these local contexts playing a prominent role in shaping individual transportation behavior. The following sections describe in detail the context for the current state of transportation at multiple levels of analysis followed by further discussion of how this relates to the theoretical perspective of the current study.

National Context. The American relationship with the personal automobile, both today and historically, cannot be ignored as a contextual factor that affects the behaviors of interest for the current study. Sheller and Urry (2000) explored the car as a symbol of the global city and the ways in which the proliferation of personal automobiles in the last century has shaped social life. One particular way in which the car has shaped American cities is the way
this “quasi-private” form of transport has superseded forms of public mobilities, such as walking and public transit (Sheller & Urry, 2000), leaving those without private transportation options often without any transportation options. Sanchez (2008) explored the ways in which federal policies related to public transportation have contributed to poverty in the United States over the past four decades in particular. As personal vehicles have proliferated the country, public transportation options have become increasingly limited.

Local Context. At the local level, the specific context of Raleigh, North Carolina can have vast implications for the transportation behaviors and experiences of its residents, including homeless women. Furthermore, the specific context of homelessness within Raleigh can also have major implications for the transportation experience of the participants in the current study. Raleigh has a significant population of individuals experiencing homelessness, including homeless women. Over the course of a year, approximately 3,300 people are homeless in Wake County, with more than 200 of them, or 29%, being children. In Raleigh and Wake County, the typical homeless family is a mother and two young children (Raleigh 10 Year Plan to End Homelessness). In addition to those who are currently homeless, individuals and families who are cost burdened (paying 35% or more of their income for rent or mortgage payments) are at risk of becoming homeless. In Wake County, 31% of lower-income households are cost burdened (2005-2010 Wake County Consolidated Plan).

Subsidized housing in Raleigh is often located far from employment opportunities, requiring long commutes made even more difficult by the lack of a personal vehicle.
According to a Wake County study of unemployed respondents who had previously been on welfare but had their benefits expire, 14% cited transportation problems as the most important reason for not working, and 30% of unemployed recipients leaving Work First thought that transportation would be a barrier to getting a new job. Among employed respondents, 20% reported that they often or sometimes were late to work or missed work as a result of transportation problems (Richardson, Schoenfeld, & LaFever, 2002).

The local homelessness service providers within Raleigh have expressed the importance of transportation access as an important outcome for their clients. The Raleigh 10 Year Plan to End Homelessness identifies providing public transportation vouchers as a critical way to help those with limited earning power who may be at-risk of homelessness to keep their jobs and afford their rent, particularly for female-led families. In the list of “What’s Missing?” to help homeless individuals in the Raleigh area, the 10 Year Plan identifies adequate transportation as a critical service to support people who are homeless in order for them to regain stability and independence. The 10 Year Plan lists expanding access to public transportation among the proposed actions to support employment.

In a 2011 research project by the current researcher, surveys of clients of the Women’s Center revealed that client mobility was significantly related to access to needed services (ranging from employment services to childcare), social support, and to psychological well-being (Matson, 2011). Surveys and interviews of clients and staff revealed that the cost of transportation, client utilization of social support networks to access transportation resources, and client sense of control over one’s own mobility were all important factors that influenced
client mobility. Surveys revealed that the most commonly used mode of transportation among clients was a combination of walking and the local city bus system (Capital Area Transit), but many clients also utilized ride-sharing. A majority of clients indicated that they had no access to a personal vehicle (Matson, 2011).

Previous interviews with clients and staff at the location of the current study have revealed that cost is a significant barrier to the use of public transportation by homeless women in Raleigh, but homeless service providers are generally unable to afford to provide bus passes for more than emergency reasons. Furthermore, cost is not the only barrier to using public transit for the homeless, but, similar to other populations, issues of stigma, convenience of schedules, access to needed destinations, physical ability, access to information, and perceived control and predictability of use are all barriers to use among the homeless women in Raleigh. Although public transit options are increasing in the Triangle, bus remains the only available option. With these limited options, 62% of Wake County citizens surveyed responded that “convenient public transportation” was a “moderate” to “serious” problem, and 59% responded that “available public transportation” was a “moderate” to “serious” problem. When asked to choose, “the most important economic issue for the county,” public transportation was the second-most-selected issue, with 17.3% of respondents choosing it as the most important economic issue, more responses than “poverty,” and second only to “job opportunities” (The Wake County Community Assessment, 2006). Furthermore, previous interviews with the Capital Area Transit (CAT) bus services in Raleigh indicated that although the CAT is aware of and concerned with the
unique needs of low-income women, limited funds make it difficult to make the necessary improvements to facilitate their travel.

All of these contextual factors at the national and local levels shape individual behaviors, particularly related to travel. Therefore, the psychosocial aspects of travel behavior cannot be examined without an acknowledgement of the material boundaries within which psychosocial phenomena exist.

*Material Boundaries to Psychosocial Phenomena.* The Mobile Voice intervention seeks to compare the reduction of material barriers with the addition of a psychosocial intervention component targeted at helping an individual to adapt to and thrive in existing conditions by capitalizing on their existing strengths and resources. Previous research on intervening in individuals’ transportation behaviors has tended to focus on examining individuals’ perceptions of their transportation experience and how this affects modal choice (Groot & Steg, 2007). Such research ignores the ways in which choice is limited by the more objective factors of individuals’ material reality and environment. Research that focuses solely on the individual psychological determinants of behavior while ignoring the ways in which one’s material reality limits the range of psychological and behavioral possibilities risks falsely attributing societal inequalities to individual failures or short-comings or even to differences inherent to their race or gender. Without research that provides a more complete vision of the issue of how transportation access limits individuals’ ability to obtain and maintain independent living, “comparisons between dominant and subordinate groups will be constructed and interpreted in such a way as to (mis)represent behaviors (resulting from
oppression) as reflecting essential attributes of the subordinated groups” (Cosgrove & McHugh, 2000, p. 825).

Transportation research is beginning to examine the extent to which an individual’s specific material reality can limit their ability to get where they need to go, and that often these limitations fall along the lines of race, ethnicity, ability, age, and gender (Blumenberg, 2000; Blumenberg, 2004; Hine, 2007). Cartwright (1979) stressed the danger of examining individual behavior devoid of environmental factors in his critique of social psychology research at the time. The need to recognize non-psychological boundaries to psychological phenomena was also illustrated in Lewin’s (1951) psychological ecology in which the psychological must be embedded within the nonpsychological environment in order to be more fully understood. Similar to Lewin’s (1951) use of channel theory to examine the various environmental, cultural, and psychological factors that influence people’s eating habits, an analysis of transportation habits that takes into account psychological behaviors within the boundaries of material realities is essential to a complete understanding of human behavior.

For this reason, the current study sought to address both material boundaries of transportation behavior (through the provision of the bus pass) and psychosocial boundaries of transportation behavior (through the Mobile Voice intervention). Intervening in psychosocial factors alone would ignore the very real material constraints on the transportation choices of this sample. Expecting participants to change their habits without a change in their material reality would be an overly-simplistic and individualistic approach,
verging on victim blame. The provision of a bus pass works to increase participants’ potential actual control over their circumstances, while the psychosocial component works to increase perceived control and facilitate the implementation of the actual control in the form of a bus pass.

*Empowerment, Change, and Intervention in Community Psychology.* Interventions to improve mobility could take place at various levels within the ecological framework that determines travel behavior. Nelson and Prilleltensky (2010) described three basic levels for thinking about interventions: (1) social interventions, (2) organizational or community interventions, and (3) small group or individual interventions.

In line with Nelson and Prilleltensky’s (2011) description of small group interventions, the goal of the Mobile Voice intervention is to help an at-risk population cope with problems and identify/strengthen resources and assets, in this case, related to mobility. The core community psychology values of empowerment and social support factor largely into the design of the intervention, and it seeks to enhance the well-being of those who participate. The project also provides participants an opportunity to act beyond the individual/group level if they wish to continue to participate in the intervention beyond the initial sessions, with the recognition that much of the determinants of individual experiences occur at the societal and community levels (Nelson & Prilleltensky, 2010). If participants choose to continue to participate, opportunities for action beyond the group level will include various advocacy and awareness campaigns to be determined by the participants themselves. As discussed below, both research on transit in general and research on homeless, low-
income and disadvantaged women in particular have advocated for interventions related to capacity-building at the individual or small-group level.

Transit researchers have recommended asset- and strength-building interventions that seek to build self-esteem, self-reliance, and coping skills, while providing instruction on social networking skills in order to improve well-being (Lindquist et al., 1999). Feminist community psychologists have noted the utility of such small-group interventions as a way for the research process to be beneficial to participants (Campbell, Seifl, Wasco, & Ahrens, 2004) and as a setting for people to tell their stories (Campbell et al., 2004). Interventions rooted in feminist community psychology have sought to take research ethics beyond just refraining from doing harm and towards an ethical imperative that research improve the lives of oppressed populations, including homeless women (Paradis, 2000).

The goal of the Mobile Voice intervention goes beyond providing information, resources, and/or skills training, to facilitating perceived control over one’s mobility and the mobilization of social support. Researchers have demonstrated the importance of social networks for the homeless (Wolch et al., 1993; Wolch & Rowe, 1992), and issues created when services and housing are located far from social networks for homeless women in particular (Toohey et al., 2004). Feminist community psychology literature has emphasized the importance of interventions that stress social action and peer-group bonding, as well as the importance of group dialogue, storytelling, and coming together to solve common problems (Bond, Belenky, & Weinstock, 2000). The goal of empowerment is consistent with research on the importance of choice and control for homeless individuals, in that choice-
based services increase perceived choice and mastery while decreasing homelessness and psychiatric symptoms (Greenwood, Schaefer-McDaniel, Winkel, & Tsemberis, 2005). The goal of empowerment is also consistent with the research of feminist community psychologists who emphasize an empowerment perspective in small group interventions (Bond et al., 2000). In contrast to traditional conceptualizations of empowerment, feminist community psychology interventions have focused on “interpersonal empowerment” (Peterson, Lowe, Aquilino, & Schneider, 2005), that is a conceptualization of empowerment that is relational rather than contingent solely on individual control and mastery.

The concept of empowerment lies at a tension between two of the core values of community psychology, that of power and community. Prilleltensky and Nelson (2002) cautioned that sometimes matters that seem to be dictated solely based on individual choice are actually instances of heavily restricted choice due to the societal constraints that surround them. Therefore, community psychology must continually be aware of the ways in which their conceptualizations of key concepts are limited by their specific sociopolitical and historical context. Feminist community psychology has begun to both critique and re-envision empowerment in a way that challenges the traditional andocentric roots of the concept.

*A Feminist Conceptualization of Relational Empowerment.* Paradis (2000) advocated for a transformation of the research process into a tool to empower homeless women. The current research design seeks to abide by this injunction by approaching empowerment from a feminist perspective in order to reconceptualize empowerment in a way that balances the
community psychology values of power and community. The Mobile Voice intervention of the current study seeks to work with participants to envision ways of gaining greater control over their daily mobility and a greater awareness of root causes of the problems they face in their daily mobility. However, the Mobile Voice intervention does not stop with this definition of empowerment, but seeks to embody a relationship-based conceptualization of empowerment that was first brought to the forefront of community psychology scholarship in Riger’s (1993) critique of traditional ideas of empowerment.

Riger (1993) critiqued the community psychology conceptualization of empowerment on two assumptions. Riger (1993) argued that empowerment was rooted in the worldview of a Western, individualistic psychology and that a conceptualization of empowerment void of community could lead to competition and conflict among “empowered” groups and individuals. Furthermore, this individualist conception of empowerment also emphasized values traditionally associated with men, such as mastery, power, autonomy and control, and marginalized values traditionally associated with women, such as connectedness, communion and cooperation (Riger, 1993). The traditional conceptualization of empowerment within community psychology is problematic because it defines qualities associated with men as normative and ignores structural constraints on individual choice. As a result of an individualistic societal bias, a healthy individual is defined by being singularly agentic, and a healthy, empowered individual could be described as “one who is self-contained, independent and self-reliant, capable of asserting himself (and I do mean his) and operating according to abstract principles of justice and fairness” (Riger, 1993, p. 280). A problem
with this definition of an empowered and healthy individual is that an assumption that individuals are free agents ignores the economic and political structural pressures upon individuals, and situates problems (and solutions) within the individual, serving to minimize the role of contextual factors (Riger, 1993). Furthermore, as Riger (1993) argued, values like relatedness and expressiveness have a negative connotation and are associated with dependence and women. It follows, then, that in the traditional definition of empowerment, only men can be empowered to act on their own behalf.

Connection and communalism are also associated with other marginalized groups, groups whose choices are limited and therefore must depend on connection with others to survive. Therefore a definition of empowerment rooted solely in ideas of autonomy and independence rather than connection and communalism also ignores and devalues these groups.

The ways in which “normal” is characterized will determine the extent to which a social structure is empowering. If the social structure will “match” and facilitate the well-being and independence of individuals characterized as “normal,” but not do so for those characterized as “special” or “other,” they will then be seen as “dependent” (Sprague & Hayes, 2000). This process translates “difference” into “dependence,” and in a society in which independence and productivity is valued above all else, those labeled “dependent” are devalued (Sprague & Hayes, 2000). This can be seen in the context of mobility issues in the sense that those without the autonomy embodied in the personal vehicle are often seen as outside of what is considered “normal” and as dependent upon public structures, as are those...
without a static home base. However, Sprague and Hayes (2000) contended that the
dichotomy between independence and dependence is illusory, because, in actuality all people
are interdependent with one another. Independence in and of itself is also therefore an
illusion, as the person who appears independent, in reality, is interdependent with and
empowered by the social relationships that support her/him, but our standpoint may make
these dependencies invisible to us (Sprague & Hayes, 2000).

Therefore, interventions need to seek to balance empowerment with a commitment to
community, by focusing on interdependencies and existence of people and structures that
span group boundaries in order to emphasize common interests. Such interventions must
seek out situations where the two values are not contradictory and seek out an idea of shared,
rather than individual, control as a basis for empowerment.

Sprague and Hayes (2000) approached their discussion of self-determination and
empowerment within the context of disability from a feminist standpoint and illustrated the
ways in which our ideas of empowerment greatly shape how we problematize certain
individuals or groups. The authors critiqued the dominant standpoint on empowerment,
arguing that it should not be conceptualized as a characteristic that a person either has or does
not (Sprague & Hayes). Rather, empowerment can act as a means of self-realization within
the context of social relationships, including in the context of self-advocacy groups (Sprague
& Hayes, 2000). These empowering relationships are mutual. Such mutually empowering,
or “co-empowerment,” relationships are reciprocal with each person contributing and
benefitting.
Methodological Models for the Mobile Voice Intervention

Feminist Community Psychology Models of Intervention. Several examples of interventions based upon a relational conceptualization of empowerment exist within the feminist community psychology literature. Bond, Belenky and Weinstock (2000) sought to facilitate empowerment in their intervention through both individual and community development. The authors clarify many of the concerns Riger (1993) had regarding empowerment through avoiding a definition of empowerment rooted in control over in favor of an empowerment rooted in developing in connection with others. This feminist-inspired definition of empowerment invites participants to engage in the cocreation of knowledge rather than asserting an exclusive definition of truth. Bond et al. (2000) designed, implemented and evaluated a Listening Partners intervention among poor, rural, isolated, young, White mothers in a way that synthesized the values of feminism and community psychology throughout, resulting in lasting change. The intervention was conducted from an empowerment perspective, designed as a peer support group as well as a social action group, in order to help participants to gain a greater voice, acknowledge their own mental abilities, and pursue an idea of leadership grounded in promotion of one’s own development as well as in the promotion of the development of those in your social network (Bond et al., 2000, p. 697). Interventions were implemented through the use of dialogue, individual and group narrative, and collaborative problem-solving all within a feminist context that sought to affirm diversity, inclusiveness, strengths, social-contextual analyses, and social constructivist perspectives (Bond et al., 2000).
Listening Partners was designed to be preventive and promotional, while also acting as an action research project that sought to promote growth beyond the individual and into the community (Bond et al., 2000). Furthermore, the intervention focused on a feminist conceptualization of leadership framed in terms of nurturing the development of others, resulting in a an idea of leadership that could apply in both participants’ private and public lives (Bond et al., 2000). After participating in weekly meetings for eight months, participants in the Listening Partners program demonstrated significant increases in the levels of the Ways of Knowing interview compared to control group members over the course of the intervention and even greater increases at 10-month follow-up. Furthermore, participants demonstrated a significantly greater number of formal supports from post-test to follow-up than their control group counterparts, who reported a decrease during that time. In these ways, the Listening Partners intervention was able to find a synthesis of feminism and community psychology, from an empowerment perspective that contextualized empowerment as well as held community as not just complementary to empowerment, but essential to it.

In intervention models in which the evaluation itself is designed to be an empowering and participatory experience, evaluation and intervention may overlap significantly. For Bond et al. (2000), much of the evaluation was intentionally indistinguishable from the intervention itself, which utilized a participatory action research approach and sought to empower participants in every aspect of the research process. Bond et al. (2000) outlined the following goals for their research process:
- To evaluate participants’ experiences in a way that would enable others to hear their stories;
- To permit a comparison with related work;
- To incorporate both qualitative and quantitative measures; and
- To stay true to the theoretical framework and goals.

Furthermore, the authors noted the importance of research methodologies that, “focus upon supporting the development of a narrative community where women would experience the power of solidarity and collective voice that nurtures rather than muffles the voice of the individual” (p. 726). This perspective of a feminist conceptualization of empowerment shapes the Mobile Voice intervention’s approach to the photovoice methodology as a mechanism for improving participants’ sense of control over their daily mobility and ability to mobilize social support to meet mobility needs. Many feminist community psychology values and methodologies overlap and complement the photovoice values and methodology, including a conceptualization of relational empowerment, a focus on developing a critical consciousness, an emphasis on the importance and power of group processes, an assertion that the process of research should benefit the participants, and an ultimate goal of community change.

*Photovoice as an Intervention Mechanism.* Photovoice is used as a way for researchers to engage with a community for the purposes of problem definition and intervening in the defined problem(s) through active grassroots participation (Carlson, Engebretson, & Chamberlain, 2006). Killion and Wang (2000) defined photovoice as an
innovative participatory action-research intervention in which participants are given a camera and can photograph their own experiences in order to facilitate greater understanding in group contexts as well as in the greater community. Strack, Lovelace, Jordan, and Holmes (2010) stressed the component of photovoice that seeks to document problems in the community and address them as a group. Overall, photovoice involves “taking pictures, telling stories, and informing policy makers” (Wang, Cash, & Powers, 2000, p. 81). In order to do so, photovoice utilizes the following process (Carlson et al., 2006; Cooper & Yarbrough, 2010; Killion & Wang, 2000; Nicotera, 2007; Wang et al., 2000):

a. Participants record, reflect upon, and document their struggles and strengths;
b. Facilitators promote critical dialogue and increased understanding through group discussion about photographs;
c. Participants and facilitators act together to inform the broader, more powerful society to help facilitate desired community changes.

The desired outcomes of using the photovoice method include individual change and empowerment as well as group and whole community engagement, resulting in positive systems change (Strack et al., 2010). However, many other potential outcomes of using photovoice have been identified in the literature, including outcomes relevant to the current study.

Relevant Photovoice Outcomes. Generally, photovoice has been used to collect descriptive information about the lives of participants surrounding a specific topic area; although some benefits have also been documented as potential positive side effects of
participation (Bukowski & Buetow, 2010). This descriptive function of the photovoice methodology facilitates one of the desired goals of the current study to collect further detailed information about the mobility experiences of homeless women through their own eyes in order to describe participants’ daily lived mobility experiences. However, the desired outcomes of the photovoice process go beyond documentation (Bukowski & Buetow, 2010) and occur at multiple levels (Carlson et al., 2006; Strack et al., 2010), many of them relating to the predictors for the current study. Although improved mobility is not a documented outcome of the photovoice process, limited empirical evidence does exist that links photovoice with both sense of control and social support, each of which are reciprocally linked with mobility. Furthermore, photovoice has also been found to address the broader process-outcome goals of the current study, such as empowerment of participants through the process of research as well as taking a participatory approach to research and intervention.

Sense of Control, Efficacy, and Empowerment. An increased sense of control and self-efficacy are linked to mobility outcomes, and these predictors have been linked to use of the photovoice methodology. Among the numerous desired outcomes of photovoice that go beyond the descriptive, individual change and empowerment are key among them (Strack et al., 2010). In their review of 36 health-related photovoice articles through 2008, Catalani and Minkler (2009) observed that, “enhanced empowerment, sense of control or critical consciousness,” was one of the outcomes more consistently evaluated and documented (p. 446). In one of the other few empirical studies of the outcomes of the photovoice process, Foster-Fishman, Nowell, Deacon, Nievar, and McCann (2005) observed through qualitative
analysis an increase in perceived control over one’s life and in community change efficacy as primary outcomes among the youth and adults that participated in their photovoice project. Cooper and Yarbrough (2010) stressed that photovoice stimulates participants to articulate a more sophisticated understanding of social determinants of their issues of interest rather than just offer a list of community problems as they did in traditional focus groups. Strack et al. (2010) noted that individuals became community change agents as a result of the photovoice process and experience an increased sense of community and sense of efficacy for advocacy and empowerment, defined as, “internalized confidence to engage in advocacy” (p. 632).

Furthermore, in their work with street homeless women, Bukowski and Buetow (2010) noted that their participants demonstrated a sense of pride in the process and that it gave them something to look forward to. Carlson et al. (2006) also noted that qualitative assessment revealed a sense of collective responsibility as an outcome of their study, in which participants saw their actions as related to and able to change their current situation. Cooper and Yarbrough (2010) noted the unexpected benefit of empowerment among their participants and the pride they took in their photos. Also, there is some evidence to suggest that this sense of efficacy and control can lead to related actions and behaviors. The confidence to engage in advocacy noted by Strack et al. (2010) is also noted as a step toward engaging in advocacy. Carlson et al. (2006) noted “intentions to act” as the third stage of the Freirean model of critical consciousness that their participants experienced. This suggests that the photovoice methodology may move participants beyond
feelings of control and empowerment, toward actions to take actual control of their experience. The current study seeks to determine if similar approaches can affect participant perception of and/or actual control over change in mobility-related actions.

Photovoice and Social Support. Increased social support is another mobility predictor that is also increasingly noted as an outcome of the photovoice methodology. Participants during photovoice projects may bond as a peer support group for problem-solving and teamwork, helping each other to survive and finding solutions together, as observed by Wang et al. (2000) in their project with individual who were homeless. Wang et al. (2000) even took note of participants together outside of class and building lasting ties and friendships. In another photovoice study, Killion and Wang (2000) used a photovoice group to build connections between elderly low-income African American women and younger homeless women; such connections are particularly valuable among such stigmatized populations as the homeless.

Assuring the Effectiveness of Brief Interventions. Photovoice projects have ranged in duration from just a few hours to weeks or months of meetings. Due to the transient nature of the sample, the intervention was very brief (two sessions totaling three hours) in comparison. Literature on the effectiveness of brief motivational interviewing demonstrates that brief interventions can be effective and also provides guidelines for how to ensure the effectiveness of such interventions. The brevity of an intervention is not necessarily a barrier to its effectiveness, but rather the salience of its content. For example in reference to brief motivational interviewing, Miller and Rollnick (1991) noted extensive literature
demonstrating that just one to three sessions have an effect comparable to longer treatments, significantly greater than non-intervention comparisons, even for serious addictive behaviors. Miller and Rollnick conclude from this evidence that brief interventions can be as effective as interventions of a longer duration.

In order to ensure the potential for the current intervention is effective despite its brevity, the author borrowed from a framework for effective brief interventions in the brief motivational interview literature. Miller and Rollnick (1991) identified six critical elements for brief motivational interviews for behavior change summarized in the acronym, “FRAMES.” This framework can also be applied to the facilitation of small group discussions, informing critical elements of the current intervention.

Feedback. In order for brief interventions to be effective at generating change, participants should receive detailed, comprehensive information on their current situation, which in and of itself can present opportunities and/or motivation for change (Miller & Rollnick, 1991). For the purposes of the current intervention, participants were able to examine their own “mobility profile,” a list of their current transportation and social resources and daily travel pattern according to their pre-test survey and travel diary, as a form of formal feedback. Participants were allowed a time to comment on, correct, and add to this profile with anything they see fit.

Responsibility. A clear communication of personal responsibility for change and self-help is recommended for effective brief interventions (Miller & Rollnick, 1991). With this population in particular, care must be given to avoid anything that could be interpreted as
victim-blaming or expectations that participants make use of resources that they do not have. Furthermore, care must be taken to not portray a conceptualization of personal responsibility that emphasizes autonomy at the expense of reliance on relationships and connectivity. Therefore, this guideline must be approached with caution. In order to avoid asking participants to change their behavior without the resources necessary to do so, all participants receive an additional material resource in the form of a one-month bus pass. Throughout the process, an emphasis is put on interdependence as a desired outcome and process through which to achieve other outcomes. However, all efforts are made to communicate to participants that it is their responsibility to make use of both the material resource of the bus pass and the information and problem-solving resources they received in the intervention once they leave in order to experience the benefits of these resources and capitalize upon their existing resources.

Advice/Menu. Another component of effective short interventions is to give the participants advice to change their behavior, but allow the participants to decide how to do so or to provide the participants with a menu of potential strategies. For the purpose of this intervention, use of the bus pass is one suggested strategy as is capitalizing on existing social network resources. In addition to this, facilitators are equipped with information about any formal transportation resources that may be helpful to the participants. However, beyond these loose guidelines, the goal of the intervention is for participants to share their own informal knowledge and information about how to navigate existing transportation systems.
and cope with transportation difficulties, in the idea that they are most knowledgeable about their experiences and how to cope with them. These strategies served as the “menu.”

Empathy. Another key component of brief motivational interviewing is for the facilitator to demonstrate empathy to the participants throughout. Empathy was emphasized not only in training of facilitators but also among participants in the group meetings.

Self-Efficacy. Brief interventions are more effective if they place an emphasis on self-efficacy, hope, and optimism. As self-efficacy and sense of control over one’s mobility is a targeted mechanism of this intervention, a great deal of emphasis was placed on this throughout the process. Facilitators must demonstrate a belief in the participants’ ability to improve their mobility through this process and encourage participants’ own belief in their ability to improve their mobility using the tools provided in the intervention and through realizing and utilizing their existing resources. These guiding principles for brief intervention were used to ensure that the potential for the photovoice intervention to be effective despite its brevity.

The current study uses the photovoice methodology as a mechanism for increasing perceived control in mobility and the mobilization of social support in order to facilitate the ease and efficiency of everyday travel among a sample of women who experience homelessness (see Appendix A for further discussion on the origins and benefits of photovoice).
Research Questions and Hypotheses

*R1*: What is the added benefit to daily mobility of the mobility empowerment intervention component over the bus pass only intervention?

H1: Multilevel analysis indicates that participants in the mobility empowerment plus bus pass intervention report a significantly greater increase in diary trip-level efficiency from pre-to post-test than participants in the bus pass only group.

H2: Multilevel analysis indicates that participants in the mobility empowerment plus bus pass intervention report a significantly greater decrease in diary trip-level difficulty from pre-to post-test than participants in the bus pass only group.

Method

Participants

116 participants were recruited from several service providers serving women who are homeless or at-risk of homelessness located in a mid-sized city in the Southeastern United States during March through October. All participants who self-identified as able to read and write in English and were over 18 years of age were eligible to participate.

Randomization of participants to either intervention group followed the urn model of random allocation, so that the intervention group was randomly selected for each participant using a random number generator, but maintained an even number of participants recruited to each group (Rosenkranz, 2011).

*Special Considerations.* According to the National Coalition to End Homelessness, nationally, estimates of homeless individuals with a severe mental illness range from 20 to
25%, compared to 6% of the general population (National Coalition for the Homeless, 2012). Furthermore, a substantial percentage of homeless individuals are functionally illiterate (“UCLA Project Homelessness,” n.d.). The presence of literacy and mental health difficulties were only a problem in the extent to which they prevented participants from completing the intervention and/or evaluation materials. To address the possibility of literacy and mental health concerns among this population that might compromise an ability to complete the intervention protocol and/or evaluation measures, session facilitators were to make note of any related issues during implementation. However, no known disruptions in study completion resulted from mental health or literacy-related issues (e.g., session interruptions, inability of participants to complete measures or practice diaries, requests for help reading measures, etc.). Measures of literacy and mental health were not included in survey or diary materials due to the risk of stereotype threat that may have affected participant responses to other measures as well as their willingness to participate and/or nature of their participation in study interventions.

Furthermore, fidelity of implementation and dose strength reports were used to indicate to what extent participants were willing and able to fully participate in the Mobile Voice intervention sessions and if any disturbance occurred in these sessions that might inhibit participant participation in them. Finally, informed consent forms were used to allow participants to self-identify as able to read and understand the informed consent form as well as to confirm that, to the best of their knowledge, they are able to fully participate in study activities.
Design

The study was a longitudinal intervention comparison design. Participants were randomly assigned to one of two different interventions, bus pass only or bus pass with the addition of a Mobile Voice intervention. Participants completed pre-test measures prior to receiving the interventions (T₁), post-test measures immediately following intervention administration (T₂), and again at least one month following pre-test (T₃).

Procedure

Administration of measures and Mobile Voice intervention sessions was conducted by the current researcher and/or by trained undergraduate research assistants. All research assistants completed a confidentiality agreement and an ethics training (the CITI Collaborative Institutional Training Initiative in Human Research Curriculum) prior to interacting with participants or data. All research assistants were required to observe at least two administrations of measures and at least three administrations of intervention sessions before acting as lead administrator. All research assistants were required to complete at least two administrations of measures and intervention sessions while under observation from the lead investigator and receive feedback from her observations before leading sessions without the presence of the lead investigator. All administrators operated from administration scripts for administration of both measures and intervention sessions. Fidelity of implementation measures were completed following each Mobile Voice session, and dose strength measures were completed following each Mobile Voice intervention session by all administrators present to ensure consistency of implementation.
Pilot Administration. A pilot was administered with 9 participants before the start of data collection in order to test the understandability of all measures and the flow of administration of measures and the intervention. Specifically, the pilot explored: the understandability and face validity of measures, informed consent, and administration script; feasibility of a six-day, trip-based diary; feasibility of study timeline; how best to follow up with participants for subsequent sessions. Study procedures were updated according to results of the pilot, including the use of digital rather than disposable cameras to minimize number of participant returns, updates to wording and formatting of measures and forms, and schedule of implementation.

Recruitment. Participants were recruited through several service providers that serve women currently homeless or at-risk of homelessness through the following methods:

1. Posting flyers and through direct invitation from research team members during daily recruitment hours on-site at a day shelter.

2. Posting flyers at other shelters and other locations possibly frequented by potential participants around town (i.e., grocery stores, libraries, social services, etc.).

3. Hosting of a weekly coffee and pastry hour at a day shelter and then directly inviting attendees.

4. Recruiting on-site through a house meeting at a night shelter and then either referring participants to sessions at the day shelter or hosting sessions on-site at the night shelter.
5. Recruiting participants attending classes for another night shelter through direct invitation on-site at the day shelter.

6. Chain of referral recruitment through distribution of flyers to participants to take to other eligible participants they knew or to hang in places they frequented.

7. Later in the study, the research team also began collecting contact information at recruitment and contacting recruits with study reminders.

*Assignment and Informed Consent.* Participants were randomly assigned to one of the two intervention conditions at recruitment. When participants returned for predetermined session times based upon assignment, all participants underwent an informed consent process in which forms were given to them to sign if they consented. Forms were formatted for maximum ease of readability. Due to the vulnerability of this population, emphasis was put on the voluntary nature of participation and the confidentiality of all survey and trip data. Emphasis was also placed upon the amount of time to complete each phase of the study, study timeline, and points at which participants would receive compensation in the form of five-day bus passes. Contact information was then collected following informed consent, including phone number for current sleeping place, any other phone number at which the participant could be reached, and email address. Participants were informed that this information would only be used for study reminders.

*Pre-test (T1).* Following assignment, informed consent, and contact information collection, all participants were then trained to use the travel diary and asked to complete a practice diary sheet in the session. Participants were then asked to complete a survey at the
session and then complete a travel diary over the six days following the session as pre-test measures to complete and return before receiving either intervention or compensation.

**Travel Diary Receipt and Training.** Participants were given travel diary booklets (see Appendix B) and provided instructions and an example on how to complete them. Travel diaries instructed participants to complete one entry per trip (i.e. each time they went to a new destination). As an example, travel diaries contained one entry filled in completely with a hypothetical trip to demonstrate the data requested. Participants were asked to complete a one-page practice sheet retrospectively recording trips taken that day and/or the day before so that the study team could provide direct assistance and verify participants’ ability to complete the diary entries. Travel diaries were in booklet form and came in a waterproof bag with a writing utensil. Participants were informed verbally and through written reminders to return their diaries in one week to receive bus passes as compensation and attend session two. Participants who provided contact information were also contacted via phone and/or email with a reminder before session two.

**Survey Administration.** Participants were given a survey of pre-test measures and instructed on how to complete them. Surveys took approximately 20 minutes to complete. During the survey administration, researchers communicated to participants that the facilitator was available to read the survey aloud if reading is difficult for the participant. However no participants expressed or visibly demonstrated difficulty reading throughout the course of the study. At this point, those participants in the bus-pass-only intervention group
were finished with the in-person pre-test session, and those participants in the Mobile Voice intervention group remained in order to receive instruction on the Mobile Voice intervention.

*Mobile Voice Intervention Phase I.* The specific intervention protocol for the Mobile Voice intervention is outlined below in *Table 1 (beginning on page 65).* Participants participated in the Mobile Voice intervention in groups of 1-6 people. Participants received information on the following: (1) what is Mobile Voice?, (2) goals of current project, (3) expectations of participant roles, (4) an overview of issues of power, ethics, and legal issues related to picture-taking, (5) photography 101 training.

Participants received an in-depth overview of the Mobile Voice component of the study – including goals and examples of other similar projects. Participants then had a chance to share observations about any barriers they had noticed thus far in their experiences trying to get around town. Group facilitators worked to categorize barriers as occurring at the individual, service provider, local/city, or beyond local levels on poster sheets as participants raised their concerns. Discussion of barriers occurred in Phase I in order to increase buy-in among participants and save time to focus on strategies to overcome barriers in Phase II. No discussion of strategies for improving travel took place during Phase I.

As part of the discussion of camera power, ethics, and legal issues, participants were instructed not to take pictures of any illegal activity or to take photographs that could embarrass themselves or others. Participants were instructed that they could only take pictures with other people in them in public places. Participants were asked to initial and sign a Photographer Ethics Agreement to agree to these requirements, that they would
complete study components to the best of their ability, and that they would return cameras in the same condition they received them.

Participants were then loaned a digital camera (a Vivitar ViviCam F127 of a $40.00 value) and, as part of the photography 101 training, were shown how to use the camera and complete a practice photograph.

Participants received instructions about photo prompts at this time, both verbally and in a printed label on the camera. Participants were prompted to photograph people, places, things, and activities that (1) help them get around town, or (2) make it difficult to get around town. Participants were instructed to return their cameras with their travel journals in one week when they returned for session two in order to receive their compensation.

Participants were then given a session feedback sheet to share what they liked about the session, how it could be improved, or any other thoughts they would like to share. Throughout the session, an effort was made to set a participatory tone that encouraged open and honest sharing and attempted to minimize the hierarchy between researcher and participants as much as possible in the research environment.

Diary Return. Participants were instructed to return diaries one week after the pre-test session for session two in order to be eligible to participate in the second phase of the project. Participants could still receive compensation for returning their diaries after session two, but could no longer participate in Phase II of the project. Participants were also contacted by phone and/or email, depending on what contact information was provided, with reminders to return their diaries. Diaries were returned to a member of the research team...
present at the service provider location within operating hours. Upon return, the research
team member recorded the receipt of the diary and gave the participant their compensation
(two 5-day bus passes valued at $8.50 each). Participants were then asked to sign that they
received the passes. If participants returned in time for Phase II, they then stayed for the
second session (session two included only the immediate post-test measures for the bus-pass-
only group and included the Mobile Voice Phase II and immediate post-test measures for
Mobile Voice participants).

Camera Return. Participants in the Mobile Voice group also returned their cameras
with their diaries in order to receive their first round of incentives. Of 12 original cameras,
six were not returned over the course of the study. Participants were given Photo Permission
Slips to sign to authorize use of their photographs for research and/or publicity purposes for
the study.

Mobile Voice Intervention Phase II. Participants in the Mobile Voice intervention
group completed Phase II of the Mobile Voice Intervention upon return of their cameras and
diaries (if returned on time). Sessions were designed to be completed in groups sized from 3
to 10 participants, but session sizes ranged from 1 to 9 participants throughout the course of
the study, making some aspects of the group process discussed below more difficult with
small group numbers. Upon return, participants were asked to complete a Photo Caption
Worksheet in which they identified and wrote captions for two photographs each that
illustrate the (1) most important barriers to getting around town, (2) most important boosts to
getting around town, and (3) other important photographs. Participants then engaged in
group discussion sessions based upon their photographs as they were projected on a screen. When sharing photographs with the group, participants engaged in a SHOWD discussion (outlined in Table 1 beginning on page 65) of the photographs and what they represented (Wang et al., 2000). Throughout this part of the discussion, the facilitator continually checked in with participants by reviewing problems, strengths, and ways of overcoming barriers identified by participant photos as well as summarizing common themes portrayed through multiple participants’ photographs. The facilitator kept track of shared barriers, adding them to the wall poster sheets from Phase I. Participants then shared boosts and brainstormed ways to overcome identified barriers by capitalizing on identified boosts. Participants used this problem-solving brainstorm to think of strategies at the individual, service provider, city/local, and beyond local levels to address identified barriers as the facilitator kept track of ideas on wall posters. This Phase was designed to allow participants to share informal information with one another regarding best practices for getting around town and develop strategies for change at multiple levels. All group discussion was audio-recorded.

| Table 1  |
|-----------------|---------------|
| **Mobility Empowerment Intervention Protocol** | **Estimated Time** |
| **Component** | **(I-A) Phase I-A: Training and Camera Receipt – Facilitator-led (takes place at pre-test)** |
| | What is photovoice and what is its purpose? :00:05 |
| | Examples of other photovoice projects. :05:10 |
| | Discussion of barriers to getting around town. :10:20 |
| | Camera training, ethics, and practice photo. :20:30 |
Table 1 (continued)

<table>
<thead>
<tr>
<th>(I-B) Phase I-B: Photo Missions – Participant action (takes place between pre-test and session)</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants take pictures related to the prompts, using all photos on camera provided, over the course of four days.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(II) Phase II: Photo Discussions – Dynamic between Facilitator and Participants (takes place at session)</th>
<th>1 hour, 15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pick 6 – participants choose and write captions for two photos for each prompt and any two additional important photos.</td>
<td>0:10</td>
</tr>
<tr>
<td>Introductions – participants (re)introduce themselves to the group</td>
<td>10:15</td>
</tr>
<tr>
<td>SHOWD Discussion – participants engage in a critical group discussion of their photos and captions, the prompts, and the meaning behind their photos and captions revolving around the questions below.</td>
<td>15:45</td>
</tr>
<tr>
<td>What do you see here?</td>
<td></td>
</tr>
<tr>
<td>What is really happening here?</td>
<td></td>
</tr>
<tr>
<td>How does this relate to our lives?</td>
<td></td>
</tr>
<tr>
<td>Why does this problem, concern, strength exist?</td>
<td></td>
</tr>
<tr>
<td>What can we do about it?</td>
<td></td>
</tr>
<tr>
<td>Problem-Solving Brainstorm – participants use the previous discussion to develop strategies to prevent or overcome identified barriers using existing resources, information, and skills to address these problems, at the following levels:</td>
<td>45:1:15</td>
</tr>
<tr>
<td>(a) individual strategies that participants can implement themselves to prevent and/or address identified problems by capitalizing on identified boosts, particularly help from those around them;</td>
<td></td>
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<tr>
<td>(b) service provider strategies that providers could implement to improve transportation for their clients;</td>
<td></td>
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<tr>
<td>(c) city/local strategies that the city or local community could implement to improve transportation for the participants and others;</td>
<td></td>
</tr>
<tr>
<td>(d) beyond the local strategies for other non-local entities (state or national government, media, transportation technology creators, etc.) to improve transportation for the participants and others.</td>
<td></td>
</tr>
</tbody>
</table>

At the conclusion of the discussion session, participants could receive a digital copy of their photographs on CD and were compensated with gift bags containing snacks and
toiletries for engaging in the group discussions due to the additional time required by Mobile Voice participants. Participants were informed in session one that they would have the opportunity to receive these items in session two. Gift bags were comprised of donated materials and monetary value of the bags was estimated to be around $5.00. Participants were then asked to complete the T2 immediate post-test survey and given the T2 diaries to take with them and be completed over the next six days.

Key mechanisms in order for the Mobile Voice intervention to have the strongest effect included the factors below. Dose strength and fidelity of implementation measures attempted to capture the extent that these occurred.

I. *Group Participation.* Ideally, sessions included two or more participants, and, minimally, participants must have played an active role in the session through sharing the photos they took and through engaging in discussion. Because of its participatory nature and strengths-based approach, the sessions relied on participants to share and interact with one another and the facilitator in order to facilitate the subsequent components of the intervention.

II. *Problem Identification.* Participants’ sharing of specific mobility-related problems with one another through photos, captions, and discussion was necessary in order to facilitate the subsequent components of the intervention.

III. *Critical Discussion.* Critical discussion among participants about *why* these problems happen and what could be done differently to prevent and/or overcome them was necessary in order to facilitate the subsequent components of the intervention.
IV. Information-Sharing. Although the facilitators were equipped with some formal information (such as bus schedules, shuttle information, etc), most information-sharing was to come from informal knowledge shared between participants based upon the strategies and information that they find most helpful in their own daily mobility experiences. Such information-sharing was necessary for the subsequent components of the intervention to occur.

V. Problem-Solving. Group problem-solving related to specific mobility-related problems shared by participants was necessary for the intervention to take effect. In order for the intervention to demonstrate an effect through the predicted mechanisms of social support mobilization and control over mobility, problem solving was not only at how to utilize existing material resources, but also how to utilize social support linkages to broaden one’s access to network-related mobility resources.

Immediate Post-Test (T2). Participants were asked to complete immediate post-test measures upon participating in their respective interventions (return of their first round of travel diaries and receipt of first five-day bus pass for bus-pass-only participants and completing Phase II of the Mobile Voice intervention for the Mobile Voice participants). Participants were asked to complete the second round of in-person surveys. Once surveys were complete, participants received one 5-day bus pass as compensation (an $8.50 value) for completing session two. Participants were then given a second round of travel diaries to complete over the following six days. Upon completion and return of the second round of travel diaries, participants received three 5-day bus passes as compensation (valued at $8.50
Participants had a three-day window in which to return the diaries. Participants were also contacted by phone and/or email, depending on what contact information was provided, with reminders to return diary two.

One-Month Follow-Up (T3). Participants were also asked to return for a follow-up data collection one month after the first session (T3). At this point, participants again completed in-person surveys and receive travel diaries to complete and return. When diaries were returned, participants received three 5-day bus passes as compensation (valued at $8.50 each). Participants were also contacted by phone and/or email, depending on what contact information was provided, with reminders to return for the one-month follow-up and to return diary three. Careful records were kept of participant reminders and return rates.

Measures

See Appendix B for full documentation of measures. The following measures were collected for the purpose of describing the current sample and comparing it to previous literature; these measures were not included as variables or covariates in the analyses.

Homelessness (Collected at T1, T3). Participants were asked to report their current and previous experiences of homelessness and duration of current homelessness (if applicable). Percentage of income spent on housing was used to determine risk of homelessness, with those spending 30% or more of their income housing considered at-risk of homelessness (Fiedler, Schuurman, & Hyndman, 2006).

Income (Collected at T1, T3). Participants were asked to write in their estimated total individual income for the previous month (including disability and food stamps).
Employment (Collected at T₁, T₃). Participants were asked to select their current employment status (Unable to work due to disability; Not working and not searching for work; Not working and searching for work; Currently employed part-time; Currently employed full-time; Retired).

Education (Collected at T₁). Participants were asked to select the highest level of education completed (8th grade or less; some high school; high school graduate or GED; Technical training or associates degree; Some college; College graduate; Graduate school).

Age (Collected at T₁). Participants were asked to write in their current age.

Race/Ethnicity (Collected at T₁). Participants were asked to check all that applied for which race and/or ethnicity they identify, with categories from the 2010 US Census.

Presence of Dependents (Collected at T₁, T₃). Participants were asked to write in the number of children for whom they are currently the primary caregiver.

Access to Communication Technology (Collected at T₁, T₃). Participants were asked to report if they had access to a cell phone for personal use, access to a landline phone for personal use, access to a friend’s phone whenever they needed it, access to a shelter phone whenever they needed it, and/or a place to use the internet when they needed to.

Car Access (Collected at T₁, T₃). Participants were asked to categorize their access to a personal vehicle over the past month as full access, shared access, or no access. This provided a measure of mobility that can be used to compare to previous literature as well as a general description of participant mobility for this study (Ong, 1996; Urbitran Associates, 2003).
**Trips by Car.** (Collected at T1, T3). Participants were asked to write in the number of trips they took by personal vehicle (as driver or passenger) in the past two weeks.

**Time to Public Transit** (Collected at T1, T3). Participants were asked to record the estimated time to walk to the nearest bus stop from their usual sleeping place.

**Discounted Fare** (Collected at T1, T3). Participants were asked to indicate whether they received a free/discounted bus fare and, if yes, write in what kind (such as for disability, age, or from a service provider; not the passes provided by the study).

**Physical Difficulty** (Collected at T1, T3). Participants were asked to report the extent to which it was physically easy/difficult to walk to destinations on a 4-point scale, ranging from 1 (*very easy*) to 4 (*very difficult*).

**Social Support Mobilization** (Collected at T1, T3). The Medical Outcomes Study (MOS) Social Support Survey was used to measure participant social support mobilization. The MOS was developed to be an abbreviated, multidimensional measure of social support. The MOS was developed on a population of participants suffering from chronic illness, rather than being normed on college students (which is often the case with other social support measures), and its brevity was to reduce the participant burden. As women experiencing homelessness also find themselves in a chronically stressful situation, and there is also a need to reduce participant burden in the length of measures for the current study, the MOS was considered to be a good fit. The MOS Social Support Survey contains 19 items designed to assess how often an individual has received different forms of assistance in the past month on a scale of 1 (*none of the time*) to 5 (*all of the time*) (Sherbourne & Stewart,
1991). Sherbourne and Stewart (1991) found that the MOS had a coefficient $\alpha$ of .97 and confirmed a four factor structure of emotional/info support, tangible support, positive interaction, and affection. The entire measure was administered at T1 and T3. The measure was not administered at T2 because items are framed over the past month, so administering it one week after pre-test and before participants had an opportunity to implement any strategies from the intervention was not expected to yield any differences since T1. A score for the Tangible Support subscale is reported among the descriptive variables for the current study, as tangible support was most relevant to the study outcomes. The Tangible Support subscale was computed by averaging responses to the four Tangible Support items. Example items include “Someone to take you somewhere you needed to go if you needed it,” and “Someone to help you if you were unable to complete basic daily tasks.”

For the current study, overall the MOS-Tangible Support Scale held strong reliability at T1 ($\alpha = .85$) and T3 ($\alpha = .92$). At T1, the MOS-Tan demonstrated a skewness of .53 ($SE = .34$) and a kurtosis of -.75 ($SE = .66$). At T3, the MOS-Tan demonstrated a skewness of .17 ($SE = .39$) and a kurtosis of -1.49 ($SE = .76$).

*Personal Control in Mobility Scale (PCMS)* (Collected at T1, T2, T3). The PCMS was administered to all participants to serve as a measure of one’s sense of control over daily mobility. The PCMS was developed in a previous study by the current researcher to measure the extent to which individuals are confident in their ability to draw upon personal, social, and public resources to meet their mobility needs. Questions on the PCMS are designed to assess an individual’s “agency in satisfying their transportation needs” regardless of
transportation mode (Matson, 2010, p. 70). Questions reference the respondent’s daily travel and ask participants to respond on a five-point Likert-type scale (from 1, strongly disagree, to 5, strongly agree). Example items include “whenever I want to go somewhere, I have a way to get there” and “I have people in my life that I can ask for help if I want help getting somewhere.” Ratings from each item were averaged to determine one overall PCMS score. When developed, the PCMS demonstrated an internal consistency (alpha) of .88.

For the current study, overall the PCMS held strong reliability at T1 ($\alpha = .75$), T2 ($\alpha = .81$), and T3 ($\alpha = .93$). At T1, the PCMS demonstrated a skewness of .20 ($SE = .34$) and a kurtosis of -.73 ($SE = .66$). At T2, the PCMS demonstrated a skewness of -.09 ($SE = .34$) and a kurtosis of -.55 ($SE = .67$). At T3, the PCMS demonstrated a skewness of -.22 ($SE = .39$) and a kurtosis of -1.08 ($SE = .76$).

**Outcome Measures**

Trip diaries were used to collect the two outcome variables, trip efficiency and trip ease, as well as descriptive and qualitative information on the trips. Trips were defined as occurring each time the individual went to a new destination. Participants received a booklet with slots to enter each trip, a writing utensil, and a waterproof bag. Trip diaries lasted for six days. As noted above, participants received instructions, a complete example, and an opportunity for guided practice with the research team.

*Trip Efficiency* (Collected daily at T1, T2, T3). Participants were asked to record each trip they took each day, including the estimated distance, time departed, and time arrived for each trip. Trip efficiency was calculated by dividing trip distance by trip duration for each
trip. This method of determining trip efficiency is commonly used in evaluations of the extent to which transportation can be made more efficient (Yao, Xu, & Cui, 2006).

*Trip Difficulty* (Collected daily at T1, T2, T3). Participants were asked to rate the difficulty/ease of each trip or journey on a 4-point scale, ranging from very easy to very difficult (Blumenberg, 2008).

**Process Measures**

*Fidelity of Implementation.* After Session 1 and Session 2 of the Mobile Voice intervention, the facilitator(s) rated the extent to which the session followed the prescribed plan and included the necessary components on 10 items (e.g., was each component completed, did participants engage, were there any notable interruptions). These ratings were on a 5-point scale ranging from “strongly disagree” to “strongly agree.” Items were then averaged to obtain a Fidelity of Implementation score for each facilitator for each session. Scores for all facilitators present for each session were then averaged to determine a session score for each session.

*Dose Strength.* After each Mobile Voice intervention Session 2, the facilitator(s) rated the extent to which each participant received the necessary dose to experience the effects of the intervention on 6 items (e.g., photos taken, participated in discussion, stayed for the duration of the intervention session). These ratings were on a 5-point scale ranging from “strongly disagree” to “strongly agree.” Items were then averaged to obtain a Dose Strength score rating from each facilitator for each participant. Scores for all facilitators present for each participant were then averaged to determine a Dose Strength score for each participant.
Participant Missing Data and Attrition

Participant Attrition: Diary Completion. Return rates for each diary (T1, T2, and T3) were carefully recorded. All diaries were checked to ensure that entries were made when participants returned them. Diary return rates, range in number of trips, and average number of trips per participant are reported below.

Participant Attrition: Follow-up Completion. Return rates for each session and survey completion (T1, T2, and T3) were also carefully recorded. Session return rates are reported below.

Participant Attrition: Follow-up Effort. All efforts to remind participant via phone and email (where applicable) are also recorded including dates, times, number of contacts made, and if contact was made. This information was not analyzed for the current study but will be available for future work.

Literacy Assessment. Literacy was a potential concern with this sample. However, in previous research at the current site, few participants demonstrated challenges with literacy. Furthermore, the diaries were designed to minimize the need for writing, limiting responses to checking a box or writing in only a number where possible. Facilitators watched for participants exhibiting difficulty with literacy during administration of survey measures but no noticeable difficulty was noted. No specific measure/item was administered to measure literacy due to the risk of stereotype threat and compromising the participatory nature of the researcher-participant relationship.
Missing Trips. Trip diaries also included a place to report information on trips that participants would have liked to take or needed to take but could not or did not for any reason, including desired day and time, desired destination, desired purpose, and reason for not taking trip. Missing trip data are recorded separately from trips taken, and were not reported in large enough quantity to be included in quantitative analyses.

Trip Descriptors. Other descriptive information about trip/journey destinations that were requested included the mode(s) for the trip/journey, the purpose, and the address or intersection of each starting and ending location. Furthermore, a space was included with each trip entry for participants to include any notes or observations they see as pertinent to their experience of the trip/journey. This information is not included in the analyses of the current study but will be available for future work.

Themes of Day-to-Day Travel Experiences. In addition to the above process measures, photos, photo captions, and notes and recordings of group meetings were collected for potential future qualitative analysis.

Analyses and Results

Participant Eligibility and Sample Descriptive Statistics

Refer to Figure 1 for a flow chart of study phases, data collected at each phase, and number of participants at each phase.

Participant eligibility for the Study. In order to determine which participants (n = 116) met study criteria of being currently homeless or at-risk of homelessness, the participants’ responses to several items about their homelessness and income were examined.
Homelessness. Participant homelessness or risk of homelessness was categorized and described in several ways. At T1, participants responded to whether they were currently homeless or not, with 90 participants responding as currently homeless and 24 responding as not currently homeless, and 2 not responding. Of those currently homeless, average duration of homelessness ranged from 10 days to 264 months, with a mean duration homeless of 22.47 months.

Income. Those who did not respond as currently homeless (either responding as not currently homeless or not responding) were further categorized as at-risk of homelessness if they reported spending one-third or more of their total income last month on housing, according to the definition of at-risk of homelessness outlined above (Fiedler, Schuurman, & Hyndman, 2006). Of those 26 participants not responding as currently homeless, 10 participants reported spending one-third or more of their income last month on housing, qualifying them as at-risk according to the definition above. Of the remaining 16 homed participants who either did not respond as homeless or did not report spending more than one-third of their income on housing, 5 reported no income, 4 reported spending nothing on housing last month, and 2 reported that both their “sleeping place over the past year” and “sleeping place last night” were a “shelter/mission,” and were therefore also considered justifiably included as at-risk of homelessness. Of the remaining 5 participants, 1 was spending less than one-third of their income on housing, and 4 had missing data for either income or income spent on housing. Because the extent to which they were homeless or at-
risk of homelessness could not be confirmed, these 5 participants were excluded from further analyses.

**Descriptive Variables for All Participants at Baseline.** Descriptive information on the sample of participants (n = 111), including current homelessness, income, employment, education, age, race/ethnicity, number of dependents, access to communication technology, car access, trips by car, time to walk to public transit, access to a discounted fare, physical difficulty of walking, PCMS score, and MOS-Tangible Support score, is presented at baseline by intervention group in *Table 1*. One participant was excluded from all income analyses due to responding with a monthly income of “$500,000” due to concerns about the validity of this data. Demographic data for this participant are generally missing at all time points, but responses to scale questions were complete and did not follow any abnormal patterns (such as checking all the same response) and were therefore left in all further analyses.

**Intervention Group Differences at Baseline.** The only baseline descriptive that differed significantly between intervention groups was “months homeless,” but group differences were no longer significant after excluding the two outliers over 150 months (more than three standard deviations above the mean) from the control group. No other significant difference between intervention groups on baseline descriptive variables or Time 1 outcome variables were found.
Attrition and Sample for MLM Analyses

*Participant Attrition.* Details on participant attendance of sessions and diary return rates at T1, T2, and T3 can be found in Table 2. Roughly three-quarters of participants returned Diary 1. However, roughly half of participants did not return for Session 2, and less than half returned Diaries 2 and 3. Overall, attrition occurred evenly between the intervention and control groups.

*Eligibility for Multilevel Analyses.* Those participants who completed the intervention session (Session 2) and either post-test diary (Diary 2 or Diary 3) were eligible to be included in further analyses. These minimum requirements were put into place because the primary hypothesis-testing analyses examined to what extent participation in the intervention had an effect on trip outcomes over time. Therefore at least two time points are needed and participation in the respective interventions is essential. Thus, 50 participants were available for MLM analyses (26 in intervention group, 24 in comparison group).

*Intervention Group Differences in Attrition and Eligibility.* Intervention group status was not found to significantly correlate with attendance or return rates at any stage and was not found to correlate with participant eligibility for analysis based upon the minimum attendance requirements described above (attendance at Session 2 and return of Diary 2 and/or Diary 3).

*Group Differences at Baseline between Participants Eligible versus Non-Eligible for MLM Analyses.* Those participants who met the attendance requirements to be eligible for further Multilevel analyses and those that did not were compared on all 14 baseline
descriptive variables. Baseline Personal Control in Mobility scores were found to negatively correlate with meeting these attendance requirements ($r(111) = -.23, p = .01$), with those participants responding with lower PCMS scores being more likely to meet the attendance requirements for analysis. Baseline MOS Tangible Social Support scores were also found to negatively correlate with meeting attendance requirements ($r(109) = -.33, p < .001$), with those participants responding with lower MOS Tangible Support scores being more likely to meet attendance requirements. No other baseline descriptive variables or Time 1 outcomes were found to correlate with participant eligibility for analysis based on meeting the above attendance requirements. Details on baseline descriptive variables by intervention group for the sample for analysis can be found in Table 3. Overall, those who continued to return for the study phases seemed to be at a greater disadvantage in terms of their access to social support and sense of control over their mobility, perhaps making them more in need of the resources and interaction provided through participation in the study compared to those who did not return.

*Intervention and Comparison Group Differences at Baseline in Sample for MLM Analyses.* Intervention and Comparison Group analyses were run on all descriptive variables to determine if any significant group differences existed between groups among only participants eligible for analysis. No group differences were found on any descriptive variables at baseline or in Time 1 outcome variables.
Study Outcomes.

All trip difficulty scores range from 1 (very easy) to 4 (very difficult). Trip efficiency scores were calculated by subtracting “time departed” from “time arrived” to obtain how long each trip took to complete. Then, “estimated distance” in miles for each trip was divided by trip completion time to obtain a distance/time measure in miles per minute. For the each of the trip-based outcomes – trip efficiency and trip difficulty – each participant’s trip ratings were averaged for each time point (T1, T2, and T3). Details on the study outcomes of trip difficulty and trip efficiency by group status and time point can be found in Table 4. Average trip difficulty was somewhat easier than expected for this sample – averaging around the “Somewhat Easy” category. Average Trip Efficiency was very low – which was expected for this sample due to their dependence upon walking and public transit – with efficiency averaging less than 15 miles per hour (ranging from .20 to .24 miles per minute) for both groups at all time points.

Baseline Descriptive Variables and Outcomes. Time 1 trip outcomes of trip difficulty and trip efficiency were correlated with 12 baseline characteristics for the eligible sample (N=50). Time 1 trip efficiency was found to correlate significantly with previous experience of homelessness ($r = -.32, p < .05$), with those who had previously experienced homelessness reporting lower trip efficiency. Time 1 trip efficiency was also correlated significantly with income ($r = .37, p < .05$), with those with greater income also reporting greater trip efficiency. Both of these correlations coincide with what was expected for this sample – that those who have experienced cyclical homelessness (rather than this being their first
experience of homelessness) and those with less income would also be more lacking in the transportation resources to improve trip efficiency (such as access to a personal vehicle, access to social network members with a personal vehicle, or the ability to afford bus fare).

For trip difficulty, MOS-Tangible Support was found to significantly negatively correlate with average trip difficulty at Time 1 ($r = -0.32, p < 0.05$), with those participants reporting less tangible support reporting more trip difficulty. Months homeless was found to significantly positively correlate with trip difficulty ($r = 0.34, p < 0.05$), with those participants who were homeless longer reporting more trip difficulty. Minutes to walk to the nearest public transit stop from current sleeping place was found to significantly positively correlate with trip difficulty ($r = 0.33, p < 0.05$), with a longer walk related to more average trip difficulty at Time 1. These correlations also match what was expected for this population.

**Intercorrelations among Variables.** The extent and direction of correlations with other baseline factors varies in the extent to which it fits with study expectations overall. The positive correlation between Trip Efficiency and tangible social support ($r = 0.13$), income spent on housing ($r = 0.26$), greater physical difficulty ($r = 0.22$), and discounted fare ($r = 0.28$) all fit with expectations about this population. Finally, trip efficiency is negatively correlated with trip difficulty ($r = -0.23$), but not significantly, indicating an association in the expected direction but also that these factors are distinct. There are many factors that may make trips more difficult but may not necessarily make them less efficient (e.g., an unfriendly bus driver), and factors that make trips more efficient but may not necessarily make them less difficult (e.g., riding the bus just to stay out of the rain).
For Trip Difficulty, the positive correlation with number of dependents ($r = .11$) and physical difficulty ($r = .17$) meet expectations for this population – that those participants with more dependents and more physical difficulty in walking would find travel more difficult. Negative correlations between trip difficulty and the PCMS ($r = -.26$), trips by car ($r = -.19$), and discounted fare ($r = -.14$) also did meet expectations for this population. Participants with more access to transportation resources such as a discounted fare or car experienced easier trips. Those who reported easier trips also reported a greater sense of control over their mobility. Positive correlations between trip difficulty and income ($r = .17$) and income spent on housing ($r = .18$) are also surprising in that one would expect lower income to result in higher trip difficulty due to less access to transportation resources. Finally, a negative correlation between current homelessness and trip difficulty ($r = -.17$) was unexpected – with those not currently homeless experiencing greater trip difficulty. Details on Time 1 outcome and baseline descriptive variable correlations can be found in Table 5.

As commented upon in more detail in the discussion, these participant characteristics suggest that the study was successful in recruiting from its intended population.

**Hypothesis Testing**

Multilevel modeling (MLM) was used to examine all hypotheses in terms of time points (i.e., pre-, post-test, and follow-up) (level 1) within people (level 2).

For both hypotheses one and two, the trip-level variables of trip efficiency and trip ease were predicted to depend upon the person-level variable of intervention type over time.
Separate models were conducted with group status predicting each of the two trip-level outcome variables.

Multilevel modeling (MLM) can be a useful tool for analysis when research involves the collection of nested data, or data collected simultaneously at multiple levels, such as observation points within people as in the current study. Provided theory justifies the existence of interdependence and/or interactions between these levels, the use of multilevel analyses can yield extensive benefits beyond traditional approaches. MLM should be used when observations are nested within larger groupings, such as students in schools, residents in census tracts, or times/occasions within people (Nezlek, 2001; Raudenbush & Bryk, 2002). Raudenbush and Bryk (2002) note the following three major applications of MLM: an improved estimation of effects within individuals, an ability to test cross-level effects, and the partitioning of variance and covariance components among levels. See Table 2 for an example of how data were stacked among levels for the current study, with Level 2 variables at the person-level (e.g., intervention group status) and Level 1 variables at the time-point level (e.g., average trip efficiency, average trip difficulty, PCMS score, and MOS-Tangible Support score).

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Power. Chan (2006) notes that sample size refers to number of lower-level units/observations which determines power for lower-level analyses, but that the power of higher-level and cross-level analyses depend on the number of higher-level units. Because the hypotheses for the current study involve cross-level analyses, the number of higher-level units (people) must be taken into account. G*Power (http://wwwpsycho.uni-duesseldorfaapprojects/gpower/) was used to calculate power for a repeated measures MANOVA within-between interaction, with three groups (representing the number of level 2 observations), two measurements (representing the number of level 1 observations), and an effect size of .3 (small). The analysis indicated that a sample size of 150 would be needed to have the necessary power to detect that effect. However, this is a conservative estimate of sample size for an MLM analysis.

Hypothesis One. Hypothesis one predicted that multilevel analysis would indicate that participants in the mobility empowerment plus bus pass intervention will report a significantly greater increase in diary trip-level efficiency from pre- to post-test than participants in the bus pass only group. Results of the following three analysis models can be found in Table 6.

For Model 1, a fully unconditional model was first run with only the intercept and no predictors in the model in order to determine the amount of variance in trip efficiency at each level (between person and within person). This was done to ensure sufficient variance at each level to proceed with analyses (Nezlek, 2001; Raudenbush & Bryk, 2002). Significant variability was found at both levels, with 52.10% of the variability in trip efficiency was
between people ($\tau_{00} = .01, z = 3.47, p < .001$) and 47.90% was within people ($\sigma^2 = .01, z = 5.96, p < .001$).

In Model 2, in order to determine if trip efficiency changed over time (T1, T2, T3), a Random Coefficients Regression model was conducted to determine effect of time on trip efficiency when slopes of all participants are allowed to vary randomly. Trip efficiency was not found to significantly change over time, with time accounting for 52.01% of the change in trip efficiency within people. However, significant differences were found in the interindividua rates of change in trip efficiency ($\tau_{11} = .01, z = 2.89, p = .002$).

Finally, for Model 3, an Intercepts and Slopes as Outcomes model was conducted with time point as a level one predictor and intervention group as a level two predictor in order to determine if change in trip efficiency over time differed significantly between intervention groups (i.e., a significant time point by intervention group interaction). Main effects for time point and intervention group, as well as the intervention group x time point interaction were found to be non-significant. Because negative variance was found for the between-person variance using the Raudenbush and Bryk (2002) method of determining variance explained, the Snijders and Bosker (2003) method was used to obtain the between- and within-person percentage variance explained. To do this, the model had to be rerun with constrained slopes. The model accounted for 0.41% of between-person variance and 25% of within-person variance in trip efficiency.

**Hypothesis Two.** Hypothesis two predicted that multilevel analysis would indicate that participants in the mobility empowerment plus bus pass intervention will report a
significantly greater decrease in diary trip-level difficulty from pre- to post-test than participants in the bus pass only group. Results of the following three analysis models can be found in *Table 7.*

For Model 1, a fully unconditional model was run to determine the amount of variance in trip difficulty at each level (between person and within person) to ensure sufficient variance at each level to proceed with analyses. Significant variability was found at both levels, with 84.26% of the variability in trip difficulty was between people ($\tau_{00} = .36$, $z = 4.62$, $p < .001$) and 15.74% was within people ($\sigma^2 = .07$, $z = 6.30$, $p < .001$).

In Model 2, in order to determine if trip difficulty changed over time (T1, T2, T3), a Random Coefficients Regression model was conducted to determine effect of time on trip difficulty when slopes of all participants are allowed to vary randomly. Trip difficulty was not found to significantly change over time, with time accounting for 34.00% of the change in trip difficulty within people. However, significant differences were found in the interindividual rates of change in trip difficulty ($\tau_{11} = .02$, $z = 1.84$, $p = .03$).

Finally, for Model 3, an Intercepts and Slopes as Outcomes model was conducted with time point as a level one predictor and intervention group as a level two predictor in order to determine if change in trip difficulty over time differed significantly between intervention groups (i.e., a significant time point by intervention group interaction). Main effects for time point and intervention group, as well as the intervention group x time point interaction were found to be non-significant. The model accounted for 9.22% of between-person variance and 33.94% of within-person variance in trip difficulty.
Intermediate Process Variable Change as a Function of Group Status

The Mobile Voice intervention was designed to operate via two intermediate processes – Personal Control in Mobility and Social Support Mobilization. The intervention was designed to increase both PCMS and Social Support. Descriptive information on the PCMS and MOS-Tangible Support scores by intervention status and time point can be found in Table 8.

PCMS. Results of the following three analysis models can be found in Table 9. For Model 1, a fully unconditional model was also run to determine the amount of variance in PCMS scores at each level (between person and within person) to ensure sufficient variance at each level to proceed with analyses. Significant variability was found at both levels, with 61.81% of the variability in PCMS scores was between people ($\tau_{00} = .61, z = 4.04, p < .001$) and 38.19% was within people ($\sigma^2 = .38, z = 6.59, p < .001$).

In Model 2, in order to determine if PCMS scores changed over time, a Random Coefficients Regression model was conducted to determine effect of time on PCMS when slopes of all participants are allowed to vary randomly. PCMS was found to significantly increase over time ($\gamma_{10} = .21, t = 2.98, p = .004$), with time accounting for 19.07% of the change in PCMS scores. Significant differences were not found in the interindividual rates of change in PCMS scores. This indicates that, on average, participants experienced an increase in their sense of control of their mobility over time, regardless of whether they were in the Mobile Voice group or bus pass only group. This could be due to both groups
receiving free bus passes as incentives, but, because there is no comparison group that did not receive a bus pass, other extraneous variables cannot be ruled out.

Finally, for Model 3, an Intercepts and Slopes as Outcomes model was conducted with time point as a level one predictor and intervention group as a level two predictor in order to determine if change in PCMS scores over time differed significantly between intervention groups (i.e., a significant time point by intervention group interaction). Main effects for time point and intervention group, as well as the intervention group x time point interaction were found to be non-significant. The model accounted for 41.35% of between-person variance and 19.47% of within-person variance in PCMS scores.

*MOS-Tangible Support.* Results of the following three analysis models can be found in Table 10. For Model 1, a fully unconditional model was run to determine the amount of variance in MOS-Tangible Support at each level (between person and within person) to ensure sufficient variance at each level to proceed with analyses. Significant variability was found at both levels, with 80.95% of the variability in tangible support was between people ($\tau_{00} = 1.33, z = 4.30, p < .001$) and 19.05% was within people ($\sigma^2 = .31, z = 4.33, p < .001$).

In Model 2, in order to determine if MOS-Tangible Support changed over time, a One-Way ANCOVA model was conducted to determine effect of time on tangible support with slopes constrained due to only having two time points for tangible support. Tangible support was not found to significantly change over time, with time accounting for 0.26% of the within-person change in tangible support scores. Because negative variance was found
using the Raudenbush and Bryk (2002) method of determining variance explained, the Snijders and Bosker (2003) method was used to obtain the percentage noted above.

Finally, for Model 3, a model with constrained slopes was conducted with time point as a level one predictor and intervention group as a level two predictor in order to determine if change in tangible support over time differed significantly between intervention groups (i.e., a significant time point by intervention group interaction). Main effects for time point and intervention group, as well as the intervention group x time point interaction were found to be non-significant. The model accounted for -0.95% of between-person variance and -1.47% of within-person variance in tangible support. Because negative variance was found using the Raudenbush and Bryk (2002) method of determining variance explained, the Snijders and Bosker (2003) method was then used. However, the percent variance explained was still a negative value with -1.47% of the between-person variance explained and -0.94% of the within-person variance explained, indicating that the variance explained at both levels was essentially 0.

Fidelity of Implementation. Fidelity of implementation measures were collected from each facilitator/assistant present for each Mobile Voice session at T1 and T2. Items were averaged to find a total score for each facilitator/assistant and then facilitator/assistant scores were averaged to find a total score for each session. The mean fidelity of implementation score for Session 1 was 4.53 (SD = .67). The mean fidelity of implementation for Session 2 was 4.49 (SD = .60). These were scored on a scale of 1 to 5, with higher scores representing stronger fidelity of implementation; therefore these scores represent a high level of fidelity of
implementation. Each session was therefore concluded to have been administered with a sufficient level of fidelity.

**Dose Strength.** Dose strength measures were collected from each facilitator/assistant present for each participant present at the T2 Mobile Voice session (when participant involvement in the intervention took place). Items were averaged to find a total score for each facilitator/assistant and then facilitator/assistant scores were averaged to find a total score for each participant. The mean dose strength score for Session 2 attenders was 4.49 ($SD = .78$). Scorers ranged from 2.17 to 5 among those Mobile Voice intervention participants who attended Session 2, with higher scores representing stronger dose strength. Therefore the mean score represents a high level of dose strength.

Follow-up analyses were conducted repeating the above multilevel models with dose strength predicting trip difficulty, trip efficiency, PCMS, and MOS-Tangible Support over time for just Mobile Voice intervention participants. No significant relationships were found between dose strength and change in these outcomes over time. Follow-up analyses were also conducted repeating the above multilevel models with dose strength predicting trip difficulty, trip efficiency, PCMS, and MOS-Tangible Support over time for all participants – with bus-pass-only participants receiving a score of “0” for dose strength. Again, no significant relationships were found between dose strength and change in these outcomes over time. Because the overall levels of dose strength are high with little variability, this lack of relationship with outcomes is not surprising.
Discussion

The Mobile Voice intervention sought to synthesize the literatures surrounding the critical consciousness efforts and descriptive power of photovoice (Carlson et al., 2006; Catalani & Minkler, 2009; Strack et al., 2010) with the empowerment-focus and group-process intervention style of feminist community psychology (L. A. Bond et al., 2000; M. A. Bond et al., 2000a; Hill et al., 2000b; Paradis, 2000; Riger, 1993; Sprague & Hayes, 2000). Both approaches emphasize a participatory approach with an action orientation. Similar to previous photovoice efforts, Mobile Voice sought to utilize the stories and photographs of participants surrounding a particular issue in their community and to empower participants through a process of developing critical consciousness surrounding this issue. However, inspired by feminist community psychology interventions, the intervention also sought to use the group process to facilitate the exchange of concrete and immediate strategies to implement at the individual level.

Previous research in the transportation and mobilities literatures has observed the unique difficulties low-income women face regarding transportation access and use as well as the dearth of research and policies that attempt to examine how better to meet the needs of this population (Blumenberg, 2000; Blumenberg, E., 1998, 2004). Similarly, research from homelessness literature has observed the unique transportation challenges of those without stable housing (Jocoy & Del Casino, 2008; Wolch et al., 1993; Wolch & Rowe, 1992). Therefore, the Mobile Voice intervention sought to work with an underserved and under-researched population of women experiencing homelessness. This population’s transient
nature is part of what makes them difficult to access and also made it difficult to implement
the Mobile Voice intervention with them.

**Overview of Results**

*Review of Hypotheses Outcomes.* Hypotheses predicted that participants in the
Mobile Voice intervention would demonstrate a significantly greater increase in trip
efficiency and decrease in trip difficulty than those participants only receiving a series of bus
passes. Both groups received bus passes as incentives for participation as well as to serve as
an intervention comparison to alleviate the financial barrier to travel. However, Mobile
Voice participants also received the Mobile Voice intervention in which they shared
strategies in small groups on how to improve their day-to-day travel around town - thereby
improving the travel of all present through the implementation of such strategies. However,
no significant difference was found between the intervention group and those receiving only
bus passes in change in either trip difficulty or trip efficiency over time. Overall, trip
efficiency for those only receiving a bus pass remained generally steady across three time
points; whereas those in the Mobile Voice group experienced a slight (statistically
nonsignificant) decrease in efficiency over time. For trip difficulty, those participants only
receiving a bus pass experienced a slight (statistically nonsignificant) decrease over time;
whereas Mobile Voice participants experienced a slight decrease at Time 2, but rebounded to
original levels by Time 3.

The correlates with the study outcomes of trip difficulty and trip efficiency can be
informative for homelessness service providers as well as transit decision-makers. The
relationship between the two outcomes met expectations in that it was negatively correlated, yet not significantly since these two constructs are related but not completely overlapping. The correlates with trip efficiency are not surprising – that those with lower income and that are more likely to have been previously homeless would experience lower trip efficiency.

Similarly, trip difficulty being significantly negatively correlated with tangible social support confirmed the importance of social support in providing important travel resources and help – a gap that homelessness service providers often must fill (Nyamathi et al., 2000; Rowe & Wolch, 1990; Toohey et al., 2004). Receiving help from formal social support often came up in group discussions and photographs showing different service providers that were helpful in providing bus tickets, shuttles, or other resources. Informal social support came up less often – perhaps indicating the dearth of social support accessible to this population, but did still come up at times. One participant indicated with a photograph of a man, “The guy has been a friend of mine and a friend of the family for a long time and whenever I see him he gives me a ride.”

The significant positive correlation with months homeless may indicate that this is one of many resources that is even more difficult to obtain and utilize the longer one is homeless. Finally, the significant positive correlation with minutes to walk to the nearest bus stop is important for shaping how homelessness service providers work with transit decision makers to improve ease of transit access to shelters and other services. This is also important for transit decision-makers to consider when designing transit systems overall to improve rider perceptions of ease of riding transit. Time to walk or difficulty of walking often came
up in group discussions, such as participants indicating actual physical difficulty of walking such as due to pain or disability: “City buses - create buses to accommodate people with pain walking people in between disability and fall walking,” or “Walk in traffic. No cover. In pain to ER.” Difficulty standing is another concern with limited bus shelters and benches, such as, “There is not enough sitting room for passengers after the long walk to the bus stop.” Finally, carrying a large amount of luggage is often a concern for participants who must carry all they own with them, with one participant noting, “walking with a lot of luggage up and down hill,” as a difficulty.

*Review of Intermediary Processes.* The intermediary processes of perceived control over mobility and of access to tangible support were also examined. The Mobile Voice intervention was designed to increase participant sense of control over their own mobility as well as to equip participants with strategies to utilize those around them for transportation support. Therefore, intervention effects on change in sense of control over mobility and tangible support over time were examined. However, no significant relationship between intervention status and these intermediary outcomes were found. All participants experienced a slight (statistically nonsignificant) increase in tangible social support over time. This may indicate an overall participation effect or an effect of the bus passes in particular, but other extraneous variables cannot be ruled out. Furthermore, all participants did experience a significant increase in sense of control over mobility over time – with Mobile Voice participants experiencing a slightly larger increase.
Qualitative responses on participant feedback sheets seem to support an increased sense that participants could affect change on local transportation systems and/or that they experienced an increased sense of voice through participation in the Mobile Voice sessions. Participants responded to questions about their favorite part of the study or to questions about additional comments they wanted to share with comments in ways that showed a perception of learning new strategies for them to use at the individual level, such as, “I am excited to participate and learn many more ways of getting around given any situation,” as well as a perception of the intervention facilitating change at higher levels, such as, “Great experience thus far...I look forward to learning more and participating to make a BIG difference in Raleigh, too!” Many participants commented on valuing the experience as an arena to express themselves freely with someone listening, such as, “Thanks for giving us a voice,” or “I really express my opinions on what needs to change about the buses.” This sense of voice may also lead to increased perceptions of their ability to positively impact their mobility and that of others.

The correlational relationships with the intermediary outcomes also shed light on the experiences of this sample. Tangible support and sense of control over mobility are significantly positively correlated, fitting with previous research on the importance of social support in meeting transportation needs (Cass et al., 2005; Fleming, Baum, & Singer, 1985; Lam & Rosenheck, 1999; Ureta, 2008; Wolch & Rowe, 1992). Tangible social support is also significantly correlated with income spent on housing – supporting previous literature that indicates homeless individuals may have to choose between more expensive living
situations and fewer services while staying close to social support versus moving further from social support to access more formal supports, such as shelters and subsidized housing arrangements (Roberto, 2008; Wolch et al., 1993; Wolch & Rowe, 1992). Long distances are exacerbated when one is dependent upon public transit. Participant comments often indicated the long commute times to go short distances and just overall lack of service at certain times or on certain days, such as, “Long ride times. 2-3 hours to go a short distance. Long waits between buses; Hours runs - not enough – Sundays.” Tangible social support also highly correlates with trips by car – which may be as a result of social network members providing rides. However, living closer to social support may also necessitate more trips by car if one then lives further from formal services. Furthermore, navigating resource sharing with social support members can be difficult, as indicated by this statement by a participant, “People will only give a couple rides - Then avoid you or ask for gas money - only ask if have no money; so I can't give gas; wait till last minute to ask for ride; try every other option first. Family will remind you 6 months later that they helped you.”

Finally, physical difficulty of walking is significantly negatively related to social support, which is concerning that those who may be most in need of support are less likely to have access to it.

Sense of control over mobility is also significantly negatively correlated with difficulty walking which seems to indicate that one’s physical mobility may be very important in one’s sense of control over overall travel mobility. Number of dependents significantly positively correlates with control over mobility, which seems counter to
previous research that presence of dependents makes travel more difficult (Blumenberg, E., 1998, 2004; Law, 1999; McGuckin & Murakami, 1999). However, presence of dependents among this population sometimes allows access to more or different services than those to which single women have access – some of which may bolster transportation resources. Many participants expressed a concern over a dearth of services for single women, such as, “No kids or substance abuse problem = no services. What's stopping you?” indicating that women without children or a substance abuse problem are less likely to receive help because of a perception that there is no obvious barrier keeping them from helping themselves. However, women with children expressed many concerns specific to traveling with children, such as safety, cost of additional fares once children are older, and difficulties getting on and off buses with children.

**Intermediary processes and Hypotheses.** Finally, the Mobile Voice intervention did not significantly affect change over time in the intermediary processes of sense of control over mobility or utilization of tangible social support. Because the intervention was predicted to work through these mechanisms, it is not surprising that there was also no effect on the primary trip-level outcomes of the study.

**Challenges and Lessons Learned**

Overall, a major challenge of the current study was in participant recruitment and retention – a common challenge for research focusing on a highly transient and vulnerable population. The unstable and difficult nature of the everyday experiences of this population can also raise unique issues in measurement. All of these are addressed below in terms of
what specific aspects were challenges for the current study and what lessons learned here could inform future research.

*Reaching Vulnerable Populations.* The sample for the current study successfully addressed another primary goal of the current study – to reach a population often ignored by researchers and policy-makers alike (Blumenberg, E., 1998, 2004; Calsyn & Morse, 1990; North & Smith, 1993). The current study was able to successfully enroll a large number of women from a highly transient and difficult to reach. Of those women seeking services at the moderately-sized day shelter, the research team was able to enroll a high proportion of those eligible in the study. At a facility with a higher flow of unique women coming through for services, this study may have been more able to recruit a larger sample.

The women recruited matched the intended sample for the project. Most of the women recruited for the current study were currently experiencing homelessness, with less than one-fifth not currently homeless. On average, those currently experiencing homelessness had been homeless for just under one year. Of those remaining, very few were eliminated from analyses based upon not being currently at-risk of homelessness. Furthermore, over half of the women in the baseline sample had a previous experience of homelessness. These indicators coupled with information on income and employment indicate that this sample was a highly vulnerable and economically-disadvantaged population.

Additionally, observations throughout the study process suggest that many participants were among those either currently in “emergency overnight” status (i.e., not
currently enrolled in a program and therefore not guaranteed a bed each night) or were transitioning out of this status during the course of the study (i.e., into a circumstance with a more stable living situation with a guaranteed bed). This sample therefore may be an even less stable segment of an already very unstable population – adding further challenges to recruitment and retention. A potential strategy for increasing recruitment in similar studies would be to work with an existing program or facility in which women experiencing homelessness are enrolled in an on-going basis rather than working predominantly with a drop-in day center. However, by doing so, the most vulnerable members of this population will likely be excluded.

If women experiencing homelessness are seldom researched (Calsyn & Morse, 1990), then those at the fringes of this population are likely to be addressed even less, further illustrating the successful attempt to reach a highly underserved population. Additionally, the transportation-related descriptive variables indicate that the population has very limited car access and is highly dependent upon transit. They are therefore highly transportation-disadvantaged, which was the intended sample for the current study.

Challenges in Longitudinal and Experimental Study Design. The experimental nature of the study required rigidity in study scheduling which makes it highly challenging for this sample to comply. Randomly assigning participants to two groups further restricted possible return times for participants and further shrank group sizes for sessions – as those recruited at any given time were divided between intervention and control groups. Maximizing flexibility and minimizing frequency of returns and/or locating the study in a location
convenient to the intended sample’s typical sphere of activity is important and was attempted to the extent possible for the current project. This can be seen in the higher return rates for diaries than for sessions, since diaries could be dropped off within a much more flexible window of time; whereas sessions had to be attended at a specific set time. In order for this kind of research to succeed with similar samples, strategies for balancing methodological rigor and flexibility in accessing transient populations need to be further explored. For example, randomizing participants at the group level or conducting a more in-depth intervention with a smaller number of participants using less-complex analyses for evaluation in order to get a sense of the potential usefulness of this approach.

*Intervention Implementation.* Several challenges associated with the logistics of intervention implementation also may have affected its effectiveness. Measures of intervention fidelity and participant dose strength received are high, indicating that those who did attend the intervention session were likely to receive the intervention as intended and to participate fully. However, small group sizes in intervention groups were detrimental to the intended group process effect of the intervention. Additionally, small group sizes in the first session result in even smaller group sizes in session two due to participant attrition. Expecting participants to return a second time for a preset session time is highly challenging. This is a critical stage in the intervention, as strategies for change are developed in Session 2. This gap between pre-test and intervention implementation was made necessary in part due to the need to conduct a pre-test diary over several days. Conducting only survey measures
for outcomes would have reduced this gap but would have also eliminated the possibility of any trip-based outcomes.

Small group size in intervention sessions was particularly detrimental to this intervention because its efficacy was dependent upon the existence of a group-sharing process in which participants actively share with one another existing strategies to overcome transportation barriers and work together to develop new strategies. The larger the group (as long as it is small enough that everyone can maintain a voice), the more strategies that can be shared and then have the potential to be implemented by those present and affect their travel experiences. Smaller group sessions and even one-participant sessions can still stimulate conscious and deliberate reflection on transportation challenges and possible solutions, possibly yielding new strategies or renewed attention to existing strategies. However, small group sizes and particularly single-person sessions can have a detrimental effect on the intended primary active ingredient of this intervention – the group process. Previous photovoice projects and feminist community psychology interventions have tended to focus efforts on a more intensive process with a smaller number of highly-committed participants rather than recruiting a larger number of less-committed participants for a less intensive process. This makes experimental design difficult and limits the range of evaluative analyses, but does allow for a more intact, and perhaps meaningful, implementation of the intervention.

Low recruitment and retention not only affected the implementation of the intervention but also the power to evaluate it successfully. Low recruitment coupled with
high attrition resulted in a relatively small sample size eligible for analyses. This results in much lower power and higher propensity for a type one error. Therefore, even if the expected, small effect size would have resulted from this intervention, low power makes it unlikely it would have been detected.

*Challenges in Measurement.* The daily trip diary outcomes of this study are a methodological strength, providing real-time (rather than retrospective) reports of trip behaviors and experiences (Bolger, Davis, & Rafaeli, 2003). Furthermore, because the two outcomes were modestly correlated with one another (with less efficient trips on average also reported as more difficult), yet demonstrated different patterns of correlations with descriptive variables, the two outcomes seem to get at distinct and important aspects of daily travel.

Use of this intensive of a data collection method with this population is somewhat unprecedented. With a larger sample at baseline, this method could have successfully produced ample data for analysis. Yet, a small sample size at baseline in the current study was further exacerbated by return rates and missing data. The trip diaries are a highly intensive form of data collection with a high level of participant burden and much room for error or omissions, particularly for the current sample who may be experiencing a very tumultuous day-to-day living situation at this time and for which managing belongings while in transit is already a challenge. Overall, participants seemed to have understood how to complete their diaries and filled them out accordingly with little major errors. Omissions, however, are common and not surprising due to the difficulty with completing entries while
on the go. Particularly, for trip efficiency, participants would have needed to complete three pieces of information per trip – departure time, arrival time, and estimated distance. If any one of these pieces of information was omitted, no score would be possible for trip efficiency on this trip.

Furthermore, although “estimated distance” tells us a great deal about the participant’s perceptions of the efficiency of the trip, it is by no means an objectively accurate measure of efficiency. Previous literature utilizing travel diaries has tended to plot detailed maps of a few individuals for descriptive information rather than to use them to evaluate outcomes in quantitative analysis (Axhausen et al., 2002; Wolch & Rowe, 1992). Follow-up analyses on the trip diaries could further examine the rich descriptive data within them, possibly even constructing such maps for these participants. Such in-depth analyses could further explore how trip-level characteristics affect trip outcomes. For example, as safety is often cited as a major concern for women riding public transit (Cass et al., 2005; Law, 1999), are trips taken after dark perceived as more difficult? Qualitative data indicated several safety concerns, such as one participant describing a picture she took of a bird stating that, “This is a huge raven/crow on a bus stop sign, signifying how I've often felt that my death could have to do with using public transportation. Left out in snow/sick - no bus/other dangers.” Another interesting question might examine the effect of using different modes of transportation on trip ease and efficiency. Finally, the trip purpose may shed light on the extent to which trips are used primarily to meet basic needs, access social support networks, or maintain a routine in one’s daily life.
The trip efficiency measure also leads to the question of whether trip efficiency is always an outcome desired by this population. For individuals who often have nowhere to go during the day because they are not permitted to stay at their night shelter, they may have a few places they need to go in order to obtain needed services, but they are less likely to need to get to their desired destinations quickly. Observations within sessions often seemed to indicate the opposite among those in the overnight emergency shelter population – that they sought places of shelter or activity to fill their days, staying on buses or in bus shelters for as long as they would be allowed, perhaps as a warm, dry, and/or air-conditioned alternative to being outside. Participants often expressed concern of having “nowhere to go” when they were not allowed to be at their night shelter, particularly on weekend days when the day shelter was closed. Time of year could also affect the desirability of efficient travel. The current study was conducted from March to October, covering the span of the summer in the Southeast, making spending more time on an air-conditioned bus more desirable than being outside. Participant discussions often had cold, heat, rain, and other inclement weather come up as a challenge of getting around town due to a dearth of bus shelters. Efficiency of travel was not a high priority for these participants. Other participants who were attempting to transition to employment and more independent living did express a desire for more efficient travel, but these participants did not make up a high percentage of the sample. This would also explain the significant negative correlation of trip efficiency with some descriptive indicators of participant vulnerability, such as lower income and previous experience of
homelessness – a possible indicator of cyclical homelessness which is a much different and often more vulnerable state than a person in a first-time homelessness experience.

Trip difficulty, however, did follow the predicted pattern of decreasing over time, even if not significantly. Due to the subjective nature of this measure and its ability to be quickly and easily completed with the check of one box per trip, it may be a more valid indicator of participants’ perceptions of their trip experiences. Measures like this may be more successful in future work with mobile evaluations and highly transient populations in which quick completion is a necessity and perceptions are of great interest. For example, research exploring what affects individuals’ propensity to choose transit, may be even more interested in riders’ perceptions of the ease of their journeys than the actual efficiency of the journey.

Potential strategies for collecting more accurate data may be the inclusion of smart phone technology to provide GPS data or the use of audio voice recorded diaries rather than written ones. However, because participants do not often have access to their own smart phones, these would need to be provided to them for the course of the study.

Intervention Strategy. With a larger sample size at baseline and therefore larger group sizes, this intervention strategy may be feasible for replication with the current extensive evaluation structure in place. However, identifying a site for large-scale replication that would provide a higher flow of potential participants would be challenging.

It is difficult to determine the effectiveness of the Mobile Voice intervention strategy given the current study’s limitations. Preliminary reviews of qualitative data and
observations during sessions indicate that returning participants were generally enthusiastic about the project and highly engaged in sessions. They developed many strategies to improve transportation at the individual, service provider, city, and beyond-city levels. The photovoice methodology yielded a wealth of descriptive information and seems to be a positive vehicle for unpacking barriers in the transportation system and developing strategies for improvement at multiple ecological levels. However, without the group process component, photovoice alone may not be enough to yield new strategies to significantly affect participants’ everyday travel behaviors and experiences.

Furthermore, the brevity necessary to maximize sample size and minimize attrition in this population limited the amount of time that could be dedicated to further developing and discussing potential strategies for change. The intervention was developed to carefully balance a focus on individual-level change and strategies for change at levels beyond the individual. Focusing solely on individual strategies may have been more practical and allowed more in-depth discussion and development of more immediate, take-away strategies. However, ignoring higher-level antecedents of barriers and the responsibility of higher-level entities in these community problems would have been counter to the empowerment focus of the intervention. Putting the full responsibility for change on a sample of women who have a limited amount actual power to improve their circumstances in a short time without providing a space in which participants could also discuss the role of service providers, the city, and other factors beyond the local level (such as social, political and economic structures, the media, etc.) would have ignored the importance of ecological context and
verged on a victim-blame approach (Sprague & Hayes, 2000). A longer intervention may allow for more in-depth development of strategies at multiple levels, but would also prove more challenging with this population particularly if a large sample size is necessary for evaluation.

**Overall Strengths**

As mentioned earlier, there were several limitations to the study that may have contributed to the failure to find the expected intervention effects: inadequate group size to create group process effects, small sample size, and possible measurement issues. However, the study also had a number of strengths.

**Recruitment of an Under-Researched Population.** The current study worked with a highly underserved and under-researched population. Research on the transportation needs, experiences, and behaviors of women, low-income individuals, and the homeless is lacking (Blumenberg, E., 1998, 2004; Calsyn & Morse, 1990), and the current sample falls at the intersection of all three of these populations. Such research is needed to better understand the transportation experiences of this population, how they may differ or overlap with other populations, and how interventions can be tailored to improve transportation access among them. Such research can also inform policy surround transportation implementation and other services for women, low-income, and/or homeless individuals.

**Innovative Approach to Measurement.** The use of trip diaries and the trip efficiency and trip difficulty measures with this population is an innovative approach to capturing the everyday transportation experiences of this population, rather than focusing on one-time
retrospective measures of mobility. These measures can be utilized with any mode of transportation and focus on one’s complete experience of getting to a desired destination rather than just their time utilizing one part of the transportation system. The measures provide information on the participant experience of trip quality as well as an indicator of how quickly a participant can fulfill a specific need with the transportation resources available to her.

Descriptive Information on Travel Behaviors. The wealth of descriptive information on the needs, behaviors, and experiences as well as other related factors for this population in the form of travel diaries, photographs, photo captions, group discussion audio, group discussion notes, and surveys is unprecedented. These data can provide qualitative and quantitative information that could be used to give a better picture of this population’s localized experience of transportation and related factors.

Extensive information on the barriers participants experienced is available and categorized by the level at which the participant sees each barrier as occurring – individual, service provider, city/local, or beyond local. Similarly, information on potential strategies for change at each of these levels was also generated. Information on barriers and strategies at the individual level could be used to develop a transportation resource manual for other women in this population. Barriers and strategies at other levels can be used to advocate for policies at the service provider and local level that relieve barriers and implement strategies.

Finally, trip diaries can provide a comprehensive picture of where this sample goes, for what purpose, at what times, how much it costs them, what modes they utilize, and any
other additional information they saw as important and opted to include. Such a picture could be very useful in future programs and service provision as well as in advocating for the needs of this population. Descriptive data could enhance service providers’ existing knowledge of the extent to which clients currently have access to transportation resources, how access differs by certain client characteristics, and how extent of access predicts other important indicators, such as social support and/or access to other needed services.

Methodological Design. The current study design was highly rigorous, implementing a longitudinal experimental intervention comparison design, with both survey and diary-level outcomes evaluated. Furthermore, analyses also unpacked possible origins of the lack of effect of the intervention on primary outcomes by examining effect on intermediary processes and examining fidelity of implementation and dose strength ratings for the intervention.

The use of multilevel modeling in analyses was able to account for the nested nature of the data, embracing the complexity of individual differences in change over time. This approach to in-depth measurement of individual travel behaviors is heretofore unknown with this population and is also unknown in use for evaluating transportation interventions. Rather, previous studies have most often used travel diaries only to provide general descriptions of patterns of travel for a few individuals (Axhausen et al., 2002; Wolch et al., 1993; Wolch & Rowe, 1992).

Participatory-Action Approach. The Mobile Voice intervention sought to implement many aspects of participatory action research (Dworski-Riggs & Langhout, 2010; Minkler,
2004; Smith, Bratini, Chambers, Jensen, & Romero, 2010) in its approach with participants and staff of the study site. An ongoing relationship with site staff was undertaken over the course of five years or more. Early research efforts sought first to gain client and staff insight about the extent to and ways in which transportation access affected clients’ everyday lives. Further early research sought to quantitatively describe the effect of client access to transportation on access to services and overall well-being. All of this early work was a necessary foundation not only for the theoretical basis of the current study, but also the relational basis of the study and face validity of its implementation. This on-going relationship with staff and clients is also important for the possibility of research results and information being used to aid site staff in their work with clients.

Furthermore, for the current study, extensive hours were spent on site beyond session times – recruiting participants and making research team available to participants to provide flexibility for return of materials. Further recruitment efforts via the coffee pastry breakfast also allowed research team members to establish on-going relationships with regular site clients. These relationships aided recruitment – increasing participant buy-in and also prompting participants to recruit others for the study. These relationships also potentially increased trust within sessions – making participants more comfortable sharing honestly with the research team. Finally, these relationships were also crucial to the final steps of the project in which participant ideas will be used to advocate for policy changes among service providers and with the city.
The future use of the information gained through this project to inform site policies as well as aid service providers in advocating for client needs with other decision makers is the final aspect of the participatory-action research aspect of the current study. Quantitative and qualitative data will be used to provide a more complete picture of this sample’s transportation needs and experiences to local decision-makers and community members. The research team will seek the on-going participation of study participants in these efforts.

**Innovative Intervention.** Although the effect of the Mobile Voice intervention on transportation outcomes is not supported by the current study, preliminary qualitative analysis indicates that participants may have experienced other positive effects of the intervention. For example, participants often indicated that the intervention encouraged them to more closely attend to their transportation experiences. One participant stated that, “I really didn't pay attention to some of these things, but doing this project. I became more aware of things...” indicating a possible increase in awareness of transportation problems as result of study participation. Another participant stated that, “I just never looked at it this way and really paid attention to the time,” as a result of using the diary, possibly indicating paying more attention to time spent in transit as the study went on.

Furthermore, the intervention approach pulls together many areas of research, including photovoice, feminist community psychology small group interventions, brief motivational interviewing, and mobilities studies to create a new and innovative approach to improving the transportation experiences of this population. Lessons were drawn from the principles of brief motivational interviewing in order to help ensure the effectiveness of this
intervention despite its brevity. Also, no known studies of photovoice have been conducted in which pre-post participant change has been assessed through qualitative and quantitative measures. Furthermore, if replicated more intensively with a smaller group of participants who were more easily able to commit to the study or with a less rigid study design, this type of intervention would warrant further exploration.

**Future Research**

Photovoice literature often cites qualitative evidence of empowerment as a “side-effect” of participation in a photovoice project (Carlson et al., 2006). Yet, the current study is the first known to systematically and quantitatively evaluation other outcomes, particularly surrounding a specific set of skills or behaviors. Therefore, further research is needed to evaluate the extent to which photovoice can be used as an effective intervention model for behavior change. Furthermore, due to the low quantitative power of the current study, deeper examination of qualitative data should be conducted to determine if qualitative reports from participants coincide with or contradict the lack of effect found for the current study on transportation experiences in quantitative analysis as well as to explore reasons for this lack of effect.

Further research is also need to unpack the relationships between actual transportation experiences, one’s perceived sense of control over them, access to social networks, and access to telecommunication technologies. Previous research has indicated that social networks can be a valuable transportation resource or link to other transportation resources (Cass et al., 2005; Fleming et al., 1985; Ureta, 2008). However, previous research has also
demonstrated that homeless individuals may have to choose between access to social networks and access to formal services (Rowe & Wolch, 1990; Wolch et al., 1993; Wolch & Rowe, 1992). This choice can also greatly affect the extent to which one has access to various types of transportation resources. For example, moving away from social network members may decrease the availability of rides from friends, but may make public transit more accessible by living further into the city or by being able to access formal services that provide bus passes or shuttles.

Similarly, the trade-off between housing and transportation costs and how this relates to social networks should also be further explored (Cass et al., 2005; Roberto, 2008; Ureta, 2008). One may be forced to choose between: (a) spending more on housing and transportation further out of the city in order to stay closer to social networks rather than choosing to access formal services, or (b) living further into the city in order to access formal services but distancing oneself from social support. These are particularly difficult decisions for a highly vulnerable population like the sample for the current study.

Finally, particularly if qualitative information suggests benefits to this intervention that the quantitative analyses did not, such as expressions of increased control and voice mentioned above, further research is needed to explore the efficacy of similar interventions. As noted above, future research could explore how to balance the intensiveness of the intervention, the rigidity of the methodology, the complexity of the analyses, and sample size/recruitment/retention issues. Future research could also attempt to replicate the Mobile Voice intervention strategy with other populations – such as “choice riders” – and in other
transportation/information technology ecologies (e.g., larger cities or rural areas) to help individuals strategize ways to overcome the barriers that keep them from easily and efficiently utilizing transit while also involving them in policy development for transit in the area. Evaluating its effectiveness with a more stable population may provide the ability to maintain rigor while also better recruiting and retaining participant.

Overall the current study provides a wealth of information about the transportation needs and experiences of the current population, but the effectiveness of the intervention tested cannot be confirmed. Future research is needed to explore potential means for intervening to improve the transportation experiences of the transportation-disadvantaged. Furthermore, changes at the individual level alone may not be enough to actualize change in transportation experiences if the structure of the transportation system does not change. For this reason, further research like the current study is needed to better understand and advocate for the needs of transportation-disadvantaged populations.
References


doi:10.1080/17450100601106153


doi:10.1177/1090198104269566


### Table 1

*Descriptive Measures of Sample at Baseline (T1).*

\(n=111\)

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<tbody>
<tr>
<td></td>
<td>(N)</td>
<td>%</td>
<td>(M) (SD)</td>
</tr>
<tr>
<td>Currently homeless</td>
<td>110</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>90</td>
<td>81.1</td>
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</tr>
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</tr>
<tr>
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<td>-</td>
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<tr>
<td>Months Homeless</td>
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<td>22.47(39.51)</td>
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<td>-</td>
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<tr>
<td>Previous homelessness</td>
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<td>-</td>
</tr>
<tr>
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<tr>
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<td>44.1</td>
<td>-</td>
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<td>N %  M (SD)</td>
<td>N %  M (SD)</td>
<td>N %  M (SD)</td>
</tr>
<tr>
<td>Missing</td>
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<td>0   -  -</td>
<td>1   -  -</td>
</tr>
<tr>
<td>Income ( ^a )</td>
<td>101  -  334.96(442.32)</td>
<td>54  -  366.30(432.23)</td>
<td>47  -  298.96(455.61)</td>
</tr>
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<td>No income</td>
<td>35   34.7 -</td>
<td>15   27.8 -</td>
<td>20   42.6 -</td>
</tr>
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<td>Missing</td>
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<td>5    -  -</td>
<td>5    -  -</td>
</tr>
<tr>
<td>Income Spent on Housing</td>
<td>104  -  171.13(313.35)</td>
<td>54  -  177.91(270.70)</td>
<td>50  -  163.8(356.4)</td>
</tr>
<tr>
<td>No income on housing</td>
<td>70   67.3 -</td>
<td>33   61.1 -</td>
<td>37   74.0 -</td>
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<td>Missing</td>
<td>7    -  -</td>
<td>5    -  -</td>
<td>52   -  -</td>
</tr>
<tr>
<td>Current employment status</td>
<td>107  -  -</td>
<td>57   -  -</td>
<td>50   -  -</td>
</tr>
<tr>
<td>Unable to work due to disability</td>
<td>28   25.2 -</td>
<td>15   25.4 -</td>
<td>13   25.0 -</td>
</tr>
<tr>
<td>Not working and not searching for work</td>
<td>13  11.7 -</td>
<td>5    8.5 -</td>
<td>8    15.4 -</td>
</tr>
<tr>
<td>Not working but searching for work</td>
<td>49   44.1 -</td>
<td>27   45.8 -</td>
<td>22   42.3 -</td>
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<tr>
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<tr>
<td>Currently employed part time</td>
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<td>6.3</td>
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<tr>
<td>Currently employed full time</td>
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<tr>
<td>Retired</td>
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<tr>
<td>Missing</td>
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<td>-</td>
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<tr>
<td>Highest level education completed</td>
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<td>-</td>
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<tr>
<td>8th grade or less</td>
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<td>Some high school</td>
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<td>High school graduate or GED</td>
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<td>27.9</td>
<td>-</td>
</tr>
<tr>
<td>Technical training or associates degree</td>
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<td>3.6</td>
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</tr>
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<td>Some college</td>
<td>36</td>
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<tr>
<td>College graduate</td>
<td>12</td>
<td>10.8</td>
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<th>Total</th>
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<th>Mobile Voice</th>
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<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>M (SD)</td>
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<td>Graduate school</td>
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<td>Missing</td>
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<td></td>
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<tr>
<td>Age</td>
<td>107</td>
<td>-</td>
<td>43.60(12.55)</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>-</td>
<td>-</td>
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<td>Race(s)/Ethnicity&lt;sup&gt;b&lt;/sup&gt;</td>
<td>107</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Black or African American</td>
<td>71</td>
<td>66.4</td>
<td>-</td>
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<tr>
<td>White</td>
<td>37</td>
<td>34.6</td>
<td>-</td>
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<tr>
<td>American Indian or Native Alaskan</td>
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<td>8.4</td>
<td>-</td>
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<tr>
<td>Hispanic, Latino, or Spanish Origin</td>
<td>6</td>
<td>5.6</td>
<td>-</td>
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<td>Other Race(s)</td>
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</tr>
<tr>
<td>Asian</td>
<td>2</td>
<td>1.9</td>
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<th></th>
<th>Total</th>
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<td>N  % M (SD)</td>
<td>N  % M (SD)</td>
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<td>Missing</td>
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<td>1 - -</td>
<td>3 - -</td>
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<td>Number of Dependents</td>
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<td>56 -.30(.71)</td>
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<td>6 - -</td>
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<td>Access to Communication Technology</td>
<td>49 - -</td>
<td>29 - -</td>
<td>20 - -</td>
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<tr>
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<td>31 63.3 -</td>
<td>17 58.6 -</td>
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<tr>
<td>Landline</td>
<td>3 6.1 -</td>
<td>1 3.4 -</td>
<td>2 10.0 -</td>
</tr>
<tr>
<td>Friend’s phone</td>
<td>3 6.1 -</td>
<td>2 6.9 -</td>
<td>1 5.0 -</td>
</tr>
<tr>
<td>Shelter phone</td>
<td>12 24.5 -</td>
<td>7 24.1 -</td>
<td>5 25.0 -</td>
</tr>
<tr>
<td>Internet</td>
<td>15 30.6 -</td>
<td>6 20.7 -</td>
<td>9 45.0 -</td>
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<tr>
<td>None of the Above</td>
<td>3 6.1 3 10.3</td>
<td>0 0</td>
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<td>%</td>
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*One outlier of 500,000 was excluded.

b The sum of percentages is greater than 100 because participants were told to check all that apply.

c This measure was added in a later version of the study survey, resulting in a high level of missing data.

d Scores ranged from 1 to 4.

e Scores ranged from 1 to 5.
Table 2

Participant attendance and return rates.
(n=111)

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<tr>
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<td>85</td>
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<td>Diary 3 Returned</td>
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<tr>
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<td></td>
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<td>Eligible for Analyses (^b)</td>
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</table>

\(^a\) Percentages indicate percent of participants returning compared to number of participants at Session 1.

\(^b\) Includes participants who attended Session 2 and returned at least one of the post-test diaries (Diary 2 and/or 3).
### Table 3

**Descriptive Measures of Sample for Analysis at T1.**

*(n=50)*

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<tbody>
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<td>%</td>
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<tr>
<td>Months homeless</td>
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<td>Missing</td>
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<td>-</td>
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<tr>
<td>Previous homelessness</td>
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<tr>
<td>No</td>
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<tbody>
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<td>Current employment status</td>
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<td>Highest level education completed</td>
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Number of trips by car

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<th>N</th>
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| Minutes to Public Transit

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<th>N</th>
<th>%</th>
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<th>N</th>
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<td>%</td>
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<td><strong>Physical Difficulty</strong></td>
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<tr>
<td>Missing</td>
<td>3</td>
<td></td>
<td>-</td>
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<tr>
<td><strong>PCMS</strong></td>
<td></td>
<td></td>
<td>2.76(.82)</td>
</tr>
<tr>
<td>Missing</td>
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<td></td>
<td>-</td>
</tr>
<tr>
<td><strong>SSA</strong></td>
<td></td>
<td></td>
<td>2.73(1.20)</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

* One outlier of 500,000 was excluded.
* The sum of percentages is greater than 100 because participants were told to check all that apply.
* This measure was added in a later version of the study survey, resulting in a high level of missing data.
* Scores ranged from 1 to 4.
* Scores ranged from 1 to 5.
Table 4

*Trip Outcomes across Intervention Groups and Time Points for Participants Eligible for Analysis.*

(n=50)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Bus Pass Only</th>
<th>Mobile Voice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M (SD)</td>
<td>N</td>
</tr>
<tr>
<td><strong>Time 1</strong></td>
<td>50</td>
<td>-</td>
<td>26</td>
</tr>
<tr>
<td>Average Trip Efficiency</td>
<td>46</td>
<td>.23(.14)</td>
<td>310</td>
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<tr>
<td>Missing</td>
<td>4</td>
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</tr>
<tr>
<td>Average Trip Difficulty</td>
<td>49</td>
<td>1.77(.63)</td>
<td>413</td>
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<td>Missing</td>
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</tr>
<tr>
<td><strong>Time 2</strong></td>
<td>48</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>Average Trip Efficiency</td>
<td>44</td>
<td>.22(.13)</td>
<td>310</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Trip Difficulty</td>
<td>48</td>
<td>1.70(.63)</td>
<td>413</td>
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<tr>
<td><strong>Time 3</strong></td>
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<tr>
<td>Average Trip Difficulty</td>
<td>32</td>
<td>1.68(.77)</td>
<td>413</td>
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<tr>
<td>Missing</td>
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Table 5

Correlations for Trip Outcomes at Time 1 and Baseline Descriptive Variables.

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<th>Measure</th>
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<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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</thead>
<tbody>
<tr>
<td>1. Mean Trip Efficiency</td>
<td>43</td>
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<td>-.23</td>
<td>.13</td>
<td>-.01</td>
<td>-.02</td>
<td>-.32*</td>
<td>-.05</td>
<td>.37*</td>
<td>.26</td>
<td>-.21</td>
<td>-.04</td>
<td>-.04</td>
<td>.22</td>
<td>.28</td>
</tr>
<tr>
<td>2. Mean Trip Difficulty</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-.32*</td>
<td>-.26</td>
<td>-.17</td>
<td>.07</td>
<td>.34*</td>
<td>.17</td>
<td>.18</td>
<td>.11</td>
<td>-.19</td>
<td>.33*</td>
<td>.17</td>
<td>-.14</td>
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<tr>
<td>3. MOS-Tan</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>.29*</td>
<td>-.08</td>
<td>-.10</td>
<td>.02</td>
<td>.14</td>
<td>.29*</td>
<td>.21</td>
<td>.33*</td>
<td>-.19</td>
<td>-.39**</td>
<td>.09</td>
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<td>4. PCMS</td>
<td>46</td>
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<td>-</td>
<td>-</td>
<td>-.16</td>
<td>-.04</td>
<td>-.14</td>
<td>.03</td>
<td>.02</td>
<td>.34*</td>
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<td>.04</td>
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<tr>
<td>5. Currently Homeless</td>
<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.19</td>
<td>-</td>
<td>-.28</td>
<td>-.26</td>
<td>-.11</td>
<td>.03</td>
<td>-.05</td>
<td>-.02</td>
<td>-.16</td>
</tr>
<tr>
<td>6. Previously Homeless</td>
<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.13</td>
<td>-.12</td>
<td>-.01</td>
<td>.06</td>
<td>.22</td>
<td>.04</td>
<td>.10</td>
<td>-.15</td>
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</tr>
<tr>
<td>7. Months Homeless</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-.04</td>
<td>-.27</td>
<td>-.06</td>
<td>-.16</td>
<td>.49**</td>
<td>-.12</td>
<td>-.24</td>
<td></td>
</tr>
<tr>
<td>8. Income</td>
<td>46</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.76**</td>
<td>.16</td>
<td>-.07</td>
<td>-.10</td>
<td>.25</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>9. Income on Housing</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>.21</td>
<td>.08</td>
<td>-.15</td>
<td>.18</td>
<td>.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Dependents</td>
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<td>-</td>
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<td>-</td>
<td>.07</td>
<td>.13</td>
<td>-.10</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Trips by Car</td>
<td>43</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-.17</td>
<td>-.25</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Minutes to Bus Stop</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.02</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Physical Difficulty</td>
<td>44</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Discounted Fare</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

*p < .05, **p < .01
Table 6

*Unstandardized Coefficients (and Standard Errors) of Multilevel Models of Intervention*

*Group and Time Point Differences in Trip Efficiency*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trip Efficiency level β0</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, ( γ_{00} )</td>
<td>0.213***(.018)</td>
<td>0.227***(.019)</td>
<td>.234***(.028)</td>
</tr>
<tr>
<td>Intervention Group, ( y_{01} )</td>
<td>-</td>
<td>-0.013(0.039)</td>
<td></td>
</tr>
<tr>
<td><strong>Time Point slope, β1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Point, ( γ_{10} )</td>
<td>-</td>
<td>-0.017 (0.014)</td>
<td>-.004(.028)</td>
</tr>
<tr>
<td>Time x Intervention, ( y_{11} )</td>
<td>-</td>
<td>-0.026(.028)</td>
<td></td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trip Efficiency (( τ_{00} ))</td>
<td>0.011***(.003)</td>
<td>0.014***(.004)</td>
<td>0.014***(.004)</td>
</tr>
<tr>
<td>Covariance (( τ_{01} ))</td>
<td>-0.003(0.002)</td>
<td>-0.003(.002)</td>
<td></td>
</tr>
<tr>
<td>Time Point slope (( τ_{11} ))</td>
<td>-</td>
<td>0.005**(.002)</td>
<td>0.005**(.002)</td>
</tr>
<tr>
<td>Within-person fluctuation (( σ^2 ))</td>
<td>0.010***(.002)</td>
<td>0.005***(.001)</td>
<td>0.005***(.001)</td>
</tr>
</tbody>
</table>

*\*p<.05 \**p<.01 \***p<.001
Table 7

Unstandardized Coefficients (and Standard Errors) of Multilevel Models of Intervention

Group and Time Point Differences in Trip Difficulty

<table>
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<tr>
<th>Fixed Effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip Efficiency level $\beta_0$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>1.72*** (0.088)</td>
<td>1.75*** (0.087)</td>
<td>1.87*** (0.119)</td>
</tr>
<tr>
<td>Intervention Group, $y_{01}$</td>
<td>-</td>
<td>-0.24 (0.172)</td>
<td>-</td>
</tr>
<tr>
<td>Time Point slope, $\beta_1$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Point, $\gamma_{10}$</td>
<td>-</td>
<td>-0.036 (0.035)</td>
<td>-0.041 (0.047)</td>
</tr>
<tr>
<td>Time x Intervention, $y_{11}$</td>
<td>-</td>
<td>-</td>
<td>0.012 (0.071)</td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trip Efficiency ($\tau_{00}$)</td>
<td>0.360*** (0.078)</td>
<td>0.335*** (0.076)</td>
<td>0.327*** (0.075)</td>
</tr>
<tr>
<td>Covariance ($\tau_{01}$)</td>
<td>0.008 (0.022)</td>
<td>0.008 (0.022)</td>
<td></td>
</tr>
<tr>
<td>Time Point slope ($\tau_{11}$)</td>
<td>-</td>
<td>0.025* (0.014)</td>
<td>0.026* (0.014)</td>
</tr>
<tr>
<td>Within-person fluctuation ($\sigma^2$)</td>
<td>0.067*** (0.011)</td>
<td>0.044*** (0.011)</td>
<td>0.044*** (0.011)</td>
</tr>
</tbody>
</table>

* $p < .05$
** $p < .01$
*** $p < .001$
Table 8

*Intermediate Outcomes across Intervention Groups and Time Points for Participants Eligible for Analysis.*

*(n=50)*

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Bus Pass Only</th>
<th>Mobile Voice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M (SD)</td>
<td>N</td>
</tr>
<tr>
<td><strong>Time 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCMS</td>
<td>50</td>
<td>2.76(.82)</td>
<td>26</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>MOS-Tangible Support</td>
<td>50</td>
<td>2.73(1.20)</td>
<td>26</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td><strong>Time 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCMS</td>
<td>48</td>
<td>2.94(.95)</td>
<td>26</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td><strong>Time 3</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCMS</td>
<td>37</td>
<td>3.23(1.24)</td>
<td>21</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>MOS-Tangible Support</td>
<td>37</td>
<td>2.91(1.41)</td>
<td>21</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 9

*Unstandardized Coefficients (and Standard Errors) of Multilevel Models of Intervention*

*Group and Time Point Differences in PCMS*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trip Efficiency level β0</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, γ00</td>
<td>2.93*** (0.123)</td>
<td>2.75*** (0.111)</td>
<td>2.86*** (0.154)</td>
</tr>
<tr>
<td>Intervention Group, γ01</td>
<td>-</td>
<td></td>
<td>-0.235 (0.222)</td>
</tr>
<tr>
<td><strong>Time Point slope, β1</strong></td>
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<td></td>
</tr>
<tr>
<td>Time Point, γ10</td>
<td>-</td>
<td>0.207** (0.070)</td>
<td>0.120 (0.092)</td>
</tr>
<tr>
<td>Time x Intervention, γ11</td>
<td>-</td>
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<td>0.195 (0.139)</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
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<td></td>
</tr>
<tr>
<td>Trip Efficiency (τ00)</td>
<td>0.610*** (0.151)</td>
<td>0.358** (0.136)</td>
<td>0.358** (0.137)</td>
</tr>
<tr>
<td>Covariance (τ01)</td>
<td>0.117 (0.063)</td>
<td>0.125* (0.063)</td>
<td></td>
</tr>
<tr>
<td>Time Point slope (τ11)</td>
<td>-</td>
<td>0.042 (0.054)</td>
<td>0.039 (0.053)</td>
</tr>
<tr>
<td>Within-person fluctuation (σ²)</td>
<td>0.377*** (0.057)</td>
<td>0.305*** (0.064)</td>
<td>0.304*** (0.064)</td>
</tr>
</tbody>
</table>

*p < .05
**p < .01
***p < .001
Table 10

*Unstandardized Coefficients (and Standard Errors) of Multilevel Models of Intervention*

*Group and Time Point Differences in MOS-Tangible Support*

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trip Efficiency level $\beta_0$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept, $\gamma_{00}$</td>
<td>$2.77^{***}(0.175)$</td>
<td>$2.73^{***}(0.181)$</td>
<td>$2.64^{***}(0.253)$</td>
</tr>
<tr>
<td>Intervention Group, $y_{01}$</td>
<td>-</td>
<td></td>
<td>$0.179(0.366)$</td>
</tr>
<tr>
<td>Time Point slope, $\beta_1$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Point, $\gamma_{10}$</td>
<td>-</td>
<td>$0.058 (0.065)$</td>
<td>$0.072(0.087)$</td>
</tr>
<tr>
<td>Time x Intervention, $y_{11}$</td>
<td>-</td>
<td></td>
<td>$-0.031(0.132)$</td>
</tr>
</tbody>
</table>

| Random Effects                             |              |              |              |
| Trip Efficiency ($\tau_{00}$)              | $1.33^{***}(0.310)$ | $1.32^{***}(0.309)$ | $1.34^{***}(0.317)$ |
| Covariance ($\tau_{01}$)                   | -            |              |              |
| Time Point slope ($\tau_{11}$)             | -            | -            | -            |
| Within-person fluctuation ($\sigma^2$)     | $0.313^{***}(0.072)$ | $0.316(0.074)$ | $0.325^{***}(0.077)$ |

* $p<.05$
** $p<.01$
*** $p<.001$
Figure 1.
Study Phases with Data Collected and Number of Participants at Each Phase.
APPENDICES
Appendix A

Origins of Photovoice. Photovoice is rooted in Paulo Freire’s education for critical consciousness, feminist theory, and community-based documentary photography (Killion & Wang, 2000; Walsh, Rutherford, & Kuzmak, 2009; Wang et al., 2000). Paolo Freire’s theoretical framework of seeing people as cocreators of their own knowledge was instrumental in the development of the photovoice process (Carlson et al., 2006; Killion & Wang, 2000; Strack et al., 2010). Freire sought to shift the power dynamics in education from a unidirectional dialectical transfer of knowledge (i.e. teacher to pupil) to a more egalitarian cocreation of knowledge through communal introspection (i.e dialogue) (Carlson et al., 2006). Freire identified three levels of consciousness of how reality was interpreted accompanied by behavioral responses, which photovoice researchers contend are also experienced by participants as they move through the photovoice process:

Magical – participants assume their own inferiority, exhibit a silent acceptance of the status quo, helplessness, and passive adaptation, which contribute to their own oppression;

Naïve – participants perceive the situation as basically sound but corrupt and exhibit horizontal violence (i.e. peer blame) rather than attacking the root cause;

Critical Consciousness – participants become aware of their own responsibility in their choices to maintain or change their reality (Carlson et al., 2006).
In order to move participants through these stages, Friere advocated a process of “praxis,” in which people are engaged in their own learning through action and reflection. Photovoice also attempts to move participants through this process (Carlson et al., 2006).

Photovoice seeks to move participants through a stage process similar to the Frierean stages (Cooper & Yarbrough, 2010; Strack et al., 2010; Wang et al., 2000). Through photovoice, facilitators seek to create a safe environment in which to engage people in observation and dialogue about their communities, sharing and speaking from their own experience. Facilitators push this dialogue toward critical reflection on why the current reality exists through seeing connections between individual situations and creating an analytical perspective to relate their situation to root causes. However, although facilitators ask questions designed to help participants “unpack” the issues brought up in discussion, participants should be the ones to be the primary drivers of the dialogue. This dialogue and critical reflection pushes participants toward increased levels of critical consciousness and then toward developing strategies and solutions for change, i.e. action. Actions are directed at motivating the social power structures to initiate community change. Throughout this process, emphasis is on empowerment, co-learning, strength-based approach, shared decision-making, mutual ownership of outcomes, and advocating for change (Strack et al., 2010).

Photovoice is also rooted in feminist theory (Killion & Wang, 2000; Wang et al., 2000). Wang et al. (2000) note that photovoice borrowed from feminist theory the idea that the accrual of power and voice are directly related. Photovoice often seeks to work with
participants who belong to groups with a high degree of stigma and/or limited influence on
decision-makers, such as residents of low-income neighborhoods or the homeless (Wang et
al., 2000). Therefore photovoice can be used to provide an avenue for public voice to these
groups (Wang et al., 2000). Furthermore, because photovoice allows participants to relay
their experiences in their own voice and from their own perspectives, it is able to add to
public discussion a previously-silenced perspective and enables efforts of self-advocacy
(Wang et al., 2000).

Participatory documentary photography has also shaped the photovoice process (Killion
& Wang, 2000; Wang et al., 2000). Bukowski and Buetow (2010) note the roots of
photovoice are in photo-mapping, auto-photography, reflexive photography, and photo-
elicititation. Participatory documentary photography is a grassroots approach to representation
that uses photography as a personal voice in order to allow groups and individuals to
generate their own photographs of their experiences rather than having a photographer
choose how their realities are portrayed (Wang et al., 2000). Photovoice goes beyond
documentation via photographs with the addition of narrative and opportunities for
advocacy (Bukowski & Buetow, 2010). Cooper and Yarbrough (2010) argue that the
benefit of incorporating the photovoice process into interventions goes beyond traditional
focus groups in that much of the descriptive level of analysis is present in the photograph,
prompting respondents to move beyond descriptive information toward questions of why
what is happening in the photograph is happening. This process provides thicker data than a
traditional focus group. Cooper and Yarbrough (2010) observed previous critiques of
photography as a “tool of power,” but stress that when used with disadvantaged groups, photography can become a power equalizer, increasing the power of the disempowered.

Why photovoice? There is evidence to suggest that photovoice relates to the desired outcomes of the current study. However, a wide array of social support and empowerment intervention possibilities exist. Therefore, the current study took several other qualities of the photovoice process into consideration in the decision to follow this process for the Mobile Voice intervention. The benefits outlined below and their fit with the theoretical perspective and needs of the specific sample were instrumental in the choice of photovoice for the Mobile Voice intervention.

Participatory and Community Based. Photovoice is rooted in the values of community-based participatory research (Carlson et al., 2006). Cooper and Yarbrough (2010) see photovoice as coming into popularity as part of a larger sentiment in public health that “community-based rather than community-placed” interventions are more effective. For example, Carlson et al. (2006) used photovoice in order to begin to answer the question, “How do university representatives elicit authentic community participation in neighborhoods where learned helplessness has created dependency thinking and where apathy has survival value?” (p. 837, emphasis added). In order to do so, Carlson et al. (2006) advocated that community-based research move beyond just a community advisory board to assist in program implementation, toward these guiding principles of community-based research: (a) community concerns and issues should guide the research selection, (b) community cultures and values should be incorporated into the research
design, and (c) community-created solutions should be implemented. Cooper and Yarbrough (2010) argue that photovoice allows the participants to drive discussion and also that this participant-driven process is more likely to result in the generation of new questions and innovative solutions.

Culturally Relevant. Photovoice places an emphasis on cultural relevance. In doing so, the process identifies with Freire’s emphasis on the influence of the culture on the individual and the individual on the culture (Carlson et al., 2006; Strack et al., 2010). The researcher/facilitator seeks to create a safe environment in order to engage the individual and stimulate critical reflection on current realities (Strack et al., 2010). The use of their own photos to elicit dialogue reduces the strangeness associated with interview or focus group situations (Bukowski & Buetow, 2010). The photovoice methodology also has the potential to access to illiterate and semiliterate populations due to its reliance on visual and verbal components rather than written (Cooper & Yarbrough, 2010).

Reflective. Photovoice uses storytelling and photography not only to document community members’ lives and concerns (Bukowski & Buetow, 2010; Carlson et al., 2006), but also to encourage reflection on their root causes and implications (Strack et al., 2010). Freirean theory of critical consciousness includes listening for emotionally-charged themes in dialogue and in visual components in order to stimulate introspection (Carlson et al., 2006).
Relational. A primary goal of photovoice is group engagement (Strack et al., 2010). By engaging participants in this process of group dialogue, photovoice has a greater potential to generate a collective vision for their community and greater agreement on potential aras for change (Carlson et al., 2006). Freirean theory of critical consciousness includes taking time for informal conversation and using emotionally-charged themes as a catalyst for collective introspection and dialogue as important components of moving through the stages of consciousness in order to foster relationship building (Carlson et al., 2006). Photovoice seeks to shift participant thinking away from the independent-dependent dichotomy toward a cultural norm of interdependency (Carlson et al., 2006). Killion and Wang (2000) observed that photovoice allowed group members to become surprisingly familiar with one another in a short time and attribute photovoice’s community-building focus with this phenomenon, even with individuals who would most likely never have connected under usual circumstances.

Action/Change Oriented. A primary goal of photovoice is to move beyond defining the problem(s) and toward intervening in them (Carlson et al., 2006). Wang et al. (2000) identify photovoice as a tool of participatory action research (PAR). Carlson et al. (2006) contends that photovoice abides by a social change theory of critical consciousness. This means that once individuals reach increased levels of consciousness about why current realities exist, they are pushed toward action (Strack et al., 2010). This action is directed at changing the social structures that hold problems in place (Strack et al., 2010). Although Cooper and Yarbrough (2010) did not carry their
photovoice project through to the action phase, they note this as a limitation and advocate the Farmer method of “observe, judge, act.”

*Empowerment-focused.* The photovoice emphasis on co-learning, strength-based approach, shared decision-making, mutually owning outcomes, and advocating for change all serve to further a sense of empowerment within the individuals involved, putting them in control of the process and pushing them toward real individual and community change (Strack et al., 2010). Carlson et al. (2006) describes a social change theory of critical consciousness as one in which individuals begin to perceive their individual choices as having consequences for their experience of reality and therefore change their attitudes to participate in creating their reality through their individual choices and behaviors.

*Beyond the Individual.* Fitting with an ecological approach to social change and intervention, photovoice seeks to effect change beyond the level of the individual (Carlson et al., 2006). Although the methodology encourages the individual to reflect and relate to other community members, it moves beyond these levels to advocate change with decision-makers and the broader community. As individuals are pushed toward action, emphasis is put on whole community engagement and motivating the social power structures to initiate community change, resulting in positive systems change (Strack et al., 2010). Bukowski and Buetow (2010) note the use of public presentations of photos in order to increase public awareness and educate the public about the lives of homeless women who live on the street.
Rich/thick data. The photovoice process also yields rich, thick data from the perspective of the participants. Cooper and Yarbrough (2010) compared the dialogue surrounding the photovoice process to traditional focus groups in their work with midwives in rural Guatemala, finding that the dialogue surrounding the photovoice process yielded more in-depth information and discussion and brought out additional information than that shared in focus groups. Participants shared deeper and more abstract concerns. Photos and accompanying stories and discussions depicted stark challenges of daily life, and participants responded with more of their own examples and other related issues. Cooper and Yarbough contend that individual photographs generated responses beyond their specific content, prompting participants to seek underlying meanings and relate to further examples.
Appendix B

*Personal Control in Mobility Scale*

STEM: Think about the ways that you get from place to place, your transportation over the last 30 days. Circle the number that indicates how much you agree or disagree with the following (1 = *Strongly Disagree* to 5 = *Strongly Agree*).

1. Whenever I want to go somewhere, I have a way to get there.
2. I feel in control of whether I can get to where I want to go each day.
3. If there’s an unexpected problem with my transportation, I can still find another way to get where I want to go.
4. If I am unhappy with something about the transportation options available to me, I can change it.
5. I have people in my life who I can ask for help if I want help getting somewhere.
6. I can always manage to solve difficult transportation problems if I try hard enough.
7. When it comes to transportation and getting where I want to go, I can usually handle whatever comes my way.
MOS Social Support Scale

During the past month, indicate the frequency with which someone...

1 = None of the time

2 = A little of the time

3 = Some of the time

4 = Most of the time

5 = All of the time

1. Someone you can count on to listen to you when you need to talk.

2. Someone to help you if you were unable to complete basic daily tasks.

3. Someone who shows you love and affection.

4. Someone to have a good time with.

5. Someone to do things with to help you get your mind off things.

6. Someone to give you information to help you understand a situation.

7. Someone to take you somewhere you needed to go if you needed it.

8. Someone to love and make you feel wanted.

9. Someone to get together with for relaxation.

10. Someone to give you good advice about a crisis.

11. Someone to provide food for you if you were unable to do it yourself.

12. Someone who hugs you.

13. Someone to do something enjoyable with.

14. Someone to confide in or talk to about yourself or your problems.
15. Someone to help you with daily chores if you needed help.

16. Someone whose advice you really want.

17. Someone to share your most private worries and fears with.

18. Someone to turn to for suggestions about how to deal with a personal problem.

Travel Diary

Please enter the date at the top of the page. Record the following information for each trip or leg of a trip (if a trip contains multiple stops or transportation modes) that you take each day. For example, if you walk from your starting location to the bus stop, then ride the bus, and then walk from the bus stop to your destination, you would make three different entries, one for each leg of your trip.

1. Trip Departure Time: __ : __ AM/PM

2. Trip Arrival Time: __ : __ AM/PM

3. Estimated Distance Traveled: ___ miles

4. Rate the how easy/difficult the trip was to complete.

   1       2       3       4
   Very Easy   Easy   Difficult   Very Difficult

5. Starting address or intersection:

   __________________________________________________________

6. Ending address or intersection:

   __________________________________________________________

7. Cost of Trip (i.e., bus fare, pay for ride, etc): $_____

8. Mode of Transportation Used:
   
a. Walk

   b. Bus

   c. Ride from someone you know
d. Taxi  

e. Shuttle Service  

f. Your own Personal Vehicle (i.e., car you own)  

g. Other ____________  

9. Purpose of Trip (check all that apply):  

   a. Social/Leisure  
   b. Work  
   c. School  
   d. Transport a friend/family member  
   e. Medical  
   f. Obtain needed service other than medical (food, financial, housing, etc)  
   g. Other ____________
General Information

I. What is your current age? _________ years old

II. With what race or races and/or ethnicity do you most closely identify (check all that apply)?

A. White

B. Black or African American

C. Hispanic, Latino or Spanish origin

D. American Indian or Native Alaskan

E. Asian

F. Native Hawaiian or Pacific Islander

G. Some other race(s). Please write in. ______________

III. What is the highest level of education you have completed?

A. 8th grade or less

B. Some high school

C. High school graduate or GED

D. Technical Training or Associates degree

E. Some College

F. College Graduate

G. Graduate School
IV. What is your current employment status?
   A. Unable to work due to a disability
   B. Not working and not searching for work
   C. Not working and searching for work
   D. Currently employed part-time
   E. Currently employed full-time

V. What was your estimated total individual income last month (including food stamps, disability, SSRI)? Enter number below. ________

VI. For how many children are you the current primary care giver? Enter number below. ________

VII. Are you currently homeless (defined as lacking fixed, regular, and adequate housing)? If yes, for how long have you been homeless?
   A. YES, how long? ______
   B. NO

VIII. How much of your income (in dollars) did you spend on the cost of housing last month? Enter an estimated number below. ________

IX. Have you had other times in the past that you have been homeless (defined as lacking fixed, regular, and adequate housing)?
   A. YES
   B. NO

X. Do you currently have a valid drivers’ license?
XI. Do you receive a discounted bus fare for age and/or disability?
   A. YES
   B. NO

XII. To what extent do you find walking physically easy/difficult?
   1   2   4   5
   Very Easy   Somewhat Easy   Somewhat Difficult   Very Difficult

XIII. Which response best describes your level of access to a personal vehicle over the last month (as either a passenger or driver)?
   A. No access to a personal vehicle (i.e. you do not currently have any access to a car for personal use),
   B. Shared access to a personal vehicle (i.e. you do have a car you can use, but you must share it with someone else), or
   C. Full access to a personal vehicle (i.e. you have a car that you can use anytime you need it).

XIV. How many trips have you made using a car over the past two weeks? ____________