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The Protective Association between Pet Ownership and Depression among Street-involved Youth: A Cross-sectional Study

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ABSTRACT Street-involved youth represent a particularly vulnerable subsection of the homeless population and are at increased risk of health problems, substance abuse, and depression. Qualitative research has demonstrated that animal companions help homeless youth cope with loneliness, are motivators for positive change, such as decreasing drug or alcohol use, provide unconditional love without judgement, and improve youths' sense of health. To quantitatively investigate the association between depression and pet ownership among street-involved youth, a cross-sectional study was performed with a convenience sample of 189 street-involved youths who were surveyed in four cities in Ontario, Canada, 89 of whom were pet owners and 100 of whom were not. Logistic regression modelling found pet ownership to be negatively associated with depression in the study population (controlling for gender, regular use of drugs, and time since youth left home), with the odds of being depressed three times greater for youths who did not own pets. While pet ownership among street-involved youth has many liabilities, including impairing youths' ability to access shelter, services, and housing and employment opportunities, companion animals may offer both physical and psychosocial benefits that youth have difficult attaining. This finding highlights the importance of increased awareness among youth service providers of the potential impacts of pet ownership for street-involved youth.

Keywords: depression, homeless, pet ownership, street-involved, youth



Many youth in Canada continue to be chronically homeless, either going for long periods of time without a home, being repeatedly homeless, or both (Novac et al. 2002; Kelly and Caputo 2007). In a report on youth homelessness in Canada, youth were consulted on the terminology used to describe them (Raising the Roof 2009). The term “street-involved” was adopted to encompass the lifestyle and cycle of urban youth homelessness, therefore both “street-involved” and “homeless” are used synonymously in this paper.

In one study of 398 homeless youths in Los Angeles, 23% were pet owners (Rhoades, Winetrobe and Rice 2014). In an unpublished study of street youth in Toronto, Canada, 12.8% (29/227) of participants owned a pet. However, this is likely a conservative estimate since over 66% of the youths from that study had slept in a youth shelter the night before they were interviewed and pets are not allowed in these facilities (data collected by Gaetz, O’Grady and Buccieri 2010).¹ A study of homeless and vulnerably housed adults in Toronto, Ottawa, and Vancouver found that 11.5% of the sample population owned pets (S. Hwang, personal communication, January 15, 2010). Research has shown that street-involved youths who own pets face unique challenges in providing food and care for the pet as well as themselves. With a general lack of pet-friendly services, these owners have greater difficulty accessing shelter and other support services (Taylor, Williams and Gray 2004; Lem et al. 2013; Rhoades, Winetrobe and Rice 2014). Pet ownership impairs a street-involved youth’s abilities to seek stable housing and employment or education opportunities because of a lack of reliable pet care (Thompson et al. 2006; Bender et al. 2007; Lem et al. 2013).

Despite these challenges, according to a small body of qualitative research, the relationship between many street-youth and their pets has benefits, for example, helping these youth cope with loneliness, providing them with companionship, unconditional love, and non-judgmental support, and motivating them to act more responsibly and make better choices to avoid being separated from the pet (Rew 2000; Thompson et al. 2006; Bender et al. 2007; Lem et al. 2013). Qualitative research conducted with pet-owning youth and youth service professionals has demonstrated the strength of the human–animal bond. In a qualitative study, involving one-on-one interviews, in Ontario, Canada, the overarching theme of “pet before self” is described as a primary effect of pet ownership among street-involved youth (Lem et al. 2013). In the Lem et al. study, “pet before self” was defined as youth placing the needs of the pet ahead of their own. This could manifest itself in a variety of ways, including effects on sheltering or housing, where youth reported refusing shelter that did not accept pets, instead sleeping on the street to stay with the pet. Similarly, Rhoades, Winetrobe and Rice (2014) found that only 4% of 76 homeless youths who owned pets were staying in shelters, compared with youth who were not pet owners, of whom 16.8% were currently staying in a shelter. Youth and youth service workers also described how youths with pets developed more structure in their lives (Lem 2012). Other effects included establishing a routine and greater sense of responsibility and pride of ownership by taking good care of their pet. Street-involved youth participants described their relationship with their pet as child-like, “best friend,” or constant companion (Lem et al. 2013). This relationship seemed to be the driver for “pet before self” outcomes among these strongly pet-attached youths (Lem et al. 2013) and demonstrated a need for further exploration of the role and impacts of pet ownership for street-involved youth, including the association between pet ownership and the mental health status of youth.

Previous research has established that the mental health of homeless youth is poor. According to Kidd (2013), rates of mental illness commonly found among homeless youth

populations include “... 31% presenting with major depression, 27% with bipolar disorder, 36% with post-traumatic stress disorder (PTSD), and 40% with alcohol and drug abuse-related disorder (Kidd 2013, p. 220).” Moreover, suicide is a leading cause of death in this population (Roy et al. 2004).

The strains experienced by homeless youth begin well before they take to the streets. Many grow up in troubled households where parental drug and alcohol use, poverty, family breakdown, and childhood sexual and physical abuse are common. Not surprisingly many of these youths have histories of child welfare placement (Kidd 2013).

Although poor mental health in this population occurs before they take to the streets, adversity associated with homelessness can also augment existing mental illness or cause its onset. Not only do homeless youth regularly lack shelter and suffer nutritionally (Tarasuk, Dachner and Li 2005), they are also subject to various forms of victimization. For example, in a study of 240 Toronto street-involved youths, over 76% reported that they had been a victim of a crime within the past 12 months, and 72% reported that they had been victimized more than once during that same time period (Gaetz, O’Grady and Buccieri 2010).

While significant advancements have been made in terms of either documenting or exploring the causes of these problems, addressing these high rates of mental illness in this population has been most challenging. In fact, the majority of mentally troubled street youths receive no treatment (Kamienieki 2001 cited in Kidd 2013), which would normally include counselling and drug therapy. As a result, many of these youths have no formal diagnosis. In addition, many are substance abusers and transients, are involved with the criminal justice system, and lack stable housing (Gaetz et al. 2013). What is lacking in the research literature is a broader understanding of what may improve the mental health of homeless youth besides professional treatment and drug therapy. Drawing on the “animals and society” literature, we explored how a pet may provide homeless youth with emotional support and help them deal with the adversity associated with homelessness, including poor mental health.

The human health benefits of pet ownership are becoming better documented. For instance, pet ownership lowers stress reactivity in cardiovascular disease (Friedmann, Thomas and Eddy 2000). In one study, the presence of a pet was associated with participants having significantly lower heart rate and blood pressure and faster recovery from psychological and physical stress than those without pets (Allen, Blasovich and Mendes 2002).

The benefits of companion animals also make the lives of the homeless more bearable. In a California ethnography study, Irvine Kahl and Smith (2012) found that dogs served as “social facilitators” for homeless people who had mental health problems and difficulty initiating interactions with other people. Owning a dog led to more social interactions with pedestrians and passers-by, and made homeless people feel less invisible (Irvine, Kahl and Smith 2012). In addition, Lem et al. (2013) found that homeless youths identified putting the needs of their pets over their own interests. As a consequence, self-reported drug and/or alcohol use decreased so they could better care for their pet, and youths described avoiding arrest so that they would not be separated from their pet.

While qualitative research has provided better understanding of the positive role that pets may play in the lives of homeless people, we are unable to make broader generalizations from these small-scale studies. For the most part, past research focused on the experiences of homeless people who had companion animals without making comparisons with homeless individuals who did not have pets. In the aforementioned study of homeless youth in Los Angeles, Rhoades, Winetrobe and Rice (2014) reported that pet-owning youths ($n = 76$) had

lower average scores on the Centers for Epidemiological Studies Depression Scale (CES-D) and lower loneliness scores than non-pet owners.

Using the CES-D scale (Radloff 1977; Ayerst 1999), the current study tested whether the findings from our initial small-sample qualitative research (Lem et al. 2013) are evident in a larger population of street-involved youth. This study used precise measurement scales analyzed by logistic regression modelling. The hypothesis was that the prevalence of depression is lower for homeless youths with companion animals than for homeless youths who do not have pets.

Methods

This study obtained ethical clearance from the Research Ethics Board at the University of Guelph, a mid-sized university in southern Ontario.

Survey Development

Survey questions regarding the nature of the human–animal relationship were developed based in part on the findings obtained from qualitative research on street-involved youth and companion animals (Lem et al. 2013). Questions concerning drug use and current living situation were adopted from previous research on street-involved youth (Gaetz, O’Grady and Vaillancourt 1999).

Depression scores for all youth participants were based on the CES-D (Radloff 1977; Ayerst 1999), a validated 20-item self-report measure based on the individual’s experiences in the preceding seven days. For example, participants responded to questions such as “I was bothered by things that don’t usually bother me” and “I thought my life had been a failure.” Each item includes four response categories: Rarely or none of the time (< 1 day); Some or a little of the time (1–2 days); Occasionally or a moderate amount of the time (3–4 days); Most or all of the time (5–7 days). Responses were scored from 0 to 3, except for four reverse-scored questions worded in a positive direction (e.g., “I felt hopeful about the future”). The CES-D has demonstrated evidence of validity (e.g., discriminating between general and patient populations, level of severity within patient groups) as well as high internal consistency, with Cronbach’s alpha coefficients ranging from 0.84 (general population) to 0.90 (clinical population) (Radloff 1977; Miller, Anton and Townson 2008).

The findings reported in this paper are part of a larger questionnaire, the results of which are reported elsewhere, that also queried youths’ sourcing of pets, role of pets, experiences of pet loss, and attachment to pets (Lem 2012). The survey was piloted with six street-involved youths to assess survey length, personal sensitivity of the questions, clarity of language, appropriate use of terminology and expressions, and completeness. Feedback from these youths was used to further refine the survey and establish the face and content validity of the questionnaire.

Peer-youth Outreach Workers

A participatory action research (PAR) approach was used in the current study, which included participation by “those who are intended as the subject of the research in all aspects of the research, including the design, implementation and analysis of the project” (Gaetz and O’Grady 2002b; O’Grady and Gaetz 2004). Peer-youth outreach workers, considered to be stakeholders and integral to assessing the issues of youth homelessness and pets, were recruited to assist with the study. A peer street-involved youth was recruited, hired, and trained to administer the questionnaire in each of three Ontario census metropolitan areas (CMAs) where the study

was conducted: Toronto, Hamilton, and Ottawa. Of the three hired youths, one was a female and a pet owner and two were males, one of whom owned a pet. The questionnaire was also administered at a fourth location, Kingston (another CMA with a population over 100,000). However, a peer-youth worker was not enlisted due to the limited time spent administering surveys at this location. Surveys were administered by the first author in this location.

The peer-youth workers recruited by the author were currently or recently street-involved. One of the peer-youth workers aided in all stages of developing the survey instrument, including editing and pretesting the questionnaire prior to the pilot. The other two were recruited after they had completed the survey themselves. Attempts were made to ensure that they were representative of the study population and were still considered at-risk, with various degrees of street-involvement. Peer-youth workers received both one-on-one training by the first author and written materials on interview techniques to minimize bias, to ensure informed consent, to protect participants' confidentiality and anonymity, and to maximize the accuracy of data recording by the peer-youth workers. The peer-youth outreach workers aided both in survey administration and recruiting street-involved youths to participate in the study.

Sampling and Recruitment

Street-involved youths were recruited via posters indicating that "a study on pet ownership among street-involved youth" was being conducted and that youths did not have to own a pet to participate. Posters were placed in drop-in centres and shelters in all four CMAs. To participate, the youth needed to be 16 to 24 years of age. This age range was chosen because 16 years is the age at which youth may leave home without parental consent, in accordance with provincial law (Government of Ontario Child and Family Services Act, RSO 1990; <http://canlii.ca/t/ldxd>), and 25 years is the age at which youth are no longer accepted into youth services in many Ontario cities and therefore must utilize adult shelter and support services. Although emancipated minors (< 16 years of age) do contribute to the street-involved youth population, they were not included in this study because of the ethical issues surrounding use of minors as research participants.

Sampling comparable numbers of pet-owning and non-pet-owning youths was purposive in order to compare these two populations; however, all youths who participated selected themselves to take part in the study. The peer-youth outreach workers and word-of-mouth among street-involved youths also played a role in recruiting participants. These three methods were used to reach youths who had various degrees of service use and street involvement. Surveys were administered on an individual basis by the first author or by the local peer-youth outreach worker at seven youth service locations in Ontario, including five drop-in centres, one transitional (or passage) home, and one youth shelter. Of these, four were in the largest CMA, with one in each of the other locations. Two of the drop-in centres were also youth shelters. Surveys were administered between March and June of 2011. Youths were compensated (\$20 CAD) for their participation.

Informed consent was obtained in writing or verbally from the participants, via signature or verbal acknowledgement that they understood the content of the consent form. A copy of the consent form was provided to each consenting participant.

Data Analysis

Modelling depression as a continuous and dichotomous variable was initially explored to assess if the model fit was improved on the basis of lower Akaike information criterion (AIC) and Bayesian information criterion (BIC) values (Stata© 10 for Windows, College Station, TX,

USA). We determined that the fit was better when modelled as a dichotomous versus continuous variable, and chose to model as dichotomous for this and interpretive reasons that were based on a well-established cut point (Frerichs, Aneshensel and Clark 1981; Needham and Crosnoe 2005), with participants scoring a total of 16 or more classified as “depressed.”

As a risk-factor variable in the depression model and adapted from previously administered surveys conducted with street-involved youths (Gaetz and O’Grady 2002a), information regarding drug use frequency was collected. Survey data collected categorical frequency-of-use of individual drugs. Individual drugs were first collapsed into four categories (drug groups were not mutually exclusive): Group 1 (cigarettes, alcohol, marijuana (CAM)); Group 2 (prescription drugs, e.g., oxycontin, and other non-prescribed prescription drugs); Group 3 (amphetamines and hallucinogens, e.g., acid, speed, ecstasy, crystal meth); and Group 4 (opiates and stimulants, e.g., cocaine, heroin, methadone). Data analysis revealed that over 95% of participants were regular users of Group 1 drugs (CAM), where “regular use” was considered using a substance six times per year or more. Individually, Groups 2, 3, and 4 were deemed too low to analyze. Combined, 31.9% of participants were regular users of Group 2, 3, and/or 4 drugs. Therefore analysis was performed by collapsing drug use into two categories, the first representing commonly used drugs (Group 1: cigarettes, alcohol, and marijuana (CAM) and the second group representing a combination of CAM plus the other three drug categories (i.e., CAM plus drugs in categories 2 to 4). In this paper, the two groups are henceforth referred to as Group 1(CAM) and Group 2 (CAM+).

As in previous studies on drug use, the categorical frequency data collected were dichotomized into “regular use” and “non-regular use” (Baron 1999), where “regular use” constituted a participant indicating use of a substance more than six times a year. This cut point was based on previous reports and research on drug use among adolescents (Tang, Wong and Schwarzer 1996; Smith et al. 2005).

All statistical analyses were conducted using IBM SPSS Statistics 19 (IBM Corporation 2010), except where noted. Descriptive statistics (means, medians, modes, standard deviations, and ranges) were calculated. Binary logistic regression was used to test factors associated with depression. Initially, a number of variables were considered for inclusion in the model-building process on the basis of the existing research and the potential of these variables for confounding. Univariable analyses were performed initially to screen for an unconditional association with the dependent variable (15 variables) (Table 1). All predictor variables for which the p value in univariable analyses was < 0.20 were incorporated. Pre-screening variables for reduction using a p value of < 0.20 is recommended when screening large number of variables, some of which may be confounders or may be part of a significant interaction term (Dohoo, Martin and Stryhn 2009).

The potential effect of clustering was assessed by including city and agency as fixed effects in the model. Regular dummy variables were automatically generated by the statistical software for the categories of agency and city (Stata® 10 for Windows, College Station, TX, USA), and if either variable was statistically significant, or if inclusion resulted in improvement of model fit determined by Likelihood Ratio Test, clustering was deemed present. A variable was considered a confounder if its inclusion in the model resulted in changing the coefficient of any of the retained variables by more than 20% (Mickey and Greenland 1989; Dohoo, Martin and Stryhn 2009). Significant continuous variables were assessed graphically for linearity using the Lowess curve (Stata® 10 for Windows, College Station, TX, USA). Collinearity was assessed using correlation matrices and Variance Inflation Factor (> 10).

Table 1. Risk factor variables tested for their unconditional association with depression and use of group 2 (CAM+) drugs.

Depression Model	Description
Interviewer	Interviewer 1–4 (author and 3 peer workers)
Study City	Ottawa vs. Toronto vs. Kingston vs. Hamilton
Study Location	Drop-in center vs. Shelter
Pet Ownership	Current pet ownership vs. No current pet ownership
Previous Pet Ownership	Yes vs. No
Participant Age	Years
Participant Gender	Male vs. Female
Participant Ethnicity	White vs. Black vs. South Asian vs. Arab/West Asian vs. Southeast Asian vs. Latin American vs. First Nation/Inuit/Metis/Other Aboriginal vs. Other
Education Level	Grade 8 or lower vs. Grade 9, 10, 11, 12, or 13 vs. Some college/university vs. College degree/diploma vs. Technical or vocational school diploma vs. University degree vs. Other
Having Child/Children	Yes vs. No
Age Which Left Home	Years
Time Since Left Home	Months
Gang Involvement	Yes vs. No
Use of Group 2 (CAM+) Drugs	Regular use of Group 2 (CAM+) drugs vs. Non-regular use of Group 2 drugs
Current Living Situation	Housed vs. Staying with friends/family vs. Sleeping in shelters vs. Sleeping outside vs. Squatting vs. Couch surfing vs. Other

The final model was developed using a manual backward elimination technique that was based on largest p values. Independent variables with p values < 0.05 were considered significant and were retained. After this process, all possible two-term interactions were tested using the retained main effects. The final model was evaluated using the Wald chi-square statistic ($p < 0.05$), and goodness-of-fit was inferred by the Hosmer-Lemeshow test ($p > 0.05$) (Hosmer and Lemeshow 2005). Where a significant interaction term existed, linear combinations were created to examine the effect of the interaction on the outcome (Stata® 10 for Windows, College Station, TX, USA). Outliers were identified using studentized residuals > 2.0 (Belsley, Kuh and Welsch 2004). The influence of outliers was assessed by leverage and Cook's influence statistic.

Results

Participants

A total of 190 youths volunteered to participate in this study. One participant was removed from the study due to failure to complete at least 50% of the questionnaire. Responses to questions on the entire questionnaire were on average 99.8% complete (range 97% to 100%). The three peer-youth workers were responsible for administering a total of 74 surveys (39.2% of all surveys) at service locations in their respective cities. The remainder of the surveys were administered by the first author. The demographic characteristics of street-involved youth participants who owned or did not own pets are shown in Table 2.

Living Situation

The age at which participants reported leaving home or foster care ranged from 10 to 24 years of age (mean \pm *SD*, 15.7 \pm 2.4 years of age; median = 16 years of age). Of the total youths

Table 2. Demographic characteristics of street-involved youth (aged 16–24 years) who were pet owners and non-pet owners.

Characteristic	Pet Owners Number (%) [*]	Non-pet Owners Number (%) [*]	Total Number (%) [†]
<i>Sex</i>			
Male	54 (60.7)	69 (69.0)	123 (65.1)
Female	35 (39.3)	31 (31.0)	66 (34.9)
<i>Age (Years)</i>			
Mean (SD)	20.9 (2.4)	20.79 (2.4)	20.86 (2.42)
Median	21.1	20.84	20.89
<i>Location</i>			
Toronto	49	65	114
Ottawa	28	24	52
Kingston	7	7	14
Hamilton	5	4	9
<i>Education ≤ Grade 11</i>	52 (58.4)	65 (65)	117 (61.9)
<i>Left Home ≤ 16 years</i>	61 (70.1) (2 missing)	67 (67)	128/187 = 68.5% (2 missing)
<i>Age Left Home (Years)</i>			
Mean age (SD)	15.55 (2.1)	15.9 (2.6)	
Median age	16.0	16.0	
<i>Ethnicity</i>			
Caucasian	65 (73)	62 (62)	127 (67.2)
African/Caribbean	12 (13.5)	25 (25)	37 (19.6)
First Nation/Aboriginal	6 (6.7)	6 (6)	12 (6.4)
Asian (South, East, and West)	4 (4.4)	4 (4)	8 (4.2)
Other	2 (2.2)	3 (3)	5 (2.6)
Total	89	100	189 (100.0)

^{*}Number and percentage are given unless otherwise specified as part of the characteristic.

[†]Percentages may not add to 100 due to rounding.

participating, 48 of the 66 females (72.7%) and 78 of the 121 males (64.4%) left home at or before the age of 16 years. Of the two transgender/transsexual youth participants, one left home at 14 and the other at 17 years of age.

Pet Owners and Their Pets

Of the 89 participants who were pet owners, 52 were male, 35 were female, and two were transgendered or transsexual. A total of 121 pets were owned at the time of the study: 52 dogs, 60 cats, and nine “other” species (2 rats; 3 rabbits; 2 bearded dragons; 1 chinchilla; 1 fish). There was a relatively equal distribution of species (the majority of which were dogs and cats) by participant gender, with 54.0% of the dogs and 56.5% of cats owned by males, and 44.0% of dogs and 42.0% of cats owned by females, and one dog and one cat each owned by a transgendered/transsexual individual. Of the “other” species, 55% (5/9) were owned by males, 33.3% (3/9) were owned by females, and one of the nine was owned by a transgendered/transsexual individual.

Drug Use

“Regular drug use” (substance use more than 6 times per year) by youth participants was found for cigarettes (83.6%), alcohol (74.1%), and marijuana (73%). Combined, 95.2% of

Table 3. Logistic regression analysis of CES-D-based diagnosis of depression from 189 street-involved youth in Ottawa, Toronto, Hamilton, and Kingston.

Predictor	β	SE	Wald's χ^2	df	p	OR	95% CI
Pet Ownership	1.086	0.378	8.250	1	0.004	2.962	1.412–6.213
Gender	1.739	0.450	14.952	1	< 0.0001	5.689	2.357–13.734
Time Since Left Home	-0.128	0.064	4.058	1	0.044	0.88	0.777–0.997
Regular Use of Drugs Other Than Cigarettes, Alcohol, and/or Marijuana	2.915	0.665	19.195	1	< 0.0001	18.457	5.009–68.011
Gender \times Drug Use interaction	-2.518	0.958	6.904	1	0.009	0.081	0.012–0.527

CES-D = Center for Epidemiologic Studies Depression Scale.

youths were regular users of cigarettes, alcohol and/or marijuana (Group 1), compared with 31.9% of youths regularly using other forms of illicit drugs (Group 2).

Depression

The prevalence of depression among all participants, based on the CES-D, was 64.5% ($n = 120$). A significant association between depression and gender (male vs. female) was noted ($\chi^2 = 8.35$; $p < 0.005$), with 57.6% (61/118) of male participants being classified as depressed compared with 78.8% (52/66) of females (Table 3).

Factors Associated with Depression among Street-involved Youth

The model for depression is presented in Table 3. For this model, responses for variables for which univariable analysis was performed were > 98% complete. Responses for all variables included in the multivariable model were 100% complete except for the time since youth left home, in which two of 189 were missing. Thus, it was determined that missing data would not be a significant factor in the model, and there was no need for imputation methods.

In the model, when controlling for gender, Group 2 drug use, and time since the youth left home, the odds of being depressed were three times greater for youths who did not own pets ($p < 0.005$; 95% CI = 1.4–6.2) than for youths who owned pets. Taking into account gender, Group 2 drug use, and pet ownership, there was a negative association between the time since youths left home and the likelihood of depression (OR = 0.88; $p < 0.05$; 95% CI = 0.777–0.997). Controlling for pet ownership and time since youths left home, a significant ($p < 0.01$) interaction term involving gender and regular use of Group 2 drugs was found. In exploring the interaction, for regular users of Group 2 drugs, the odds of being depressed were 2.2 times greater for males than females ($p = 0.36$; 95% CI = 0.09–2.44). For those that did not regularly use Group 2 drugs, the odds of being depressed were 5.7 times greater for females than males ($p < 0.0001$; 95% CI = 2.36–12.73). For females, the odds of being depressed were 1.5 times greater for those who were regular users of Group 2 drugs than those who were not regular users of Group 2 drugs ($p = 0.574$; 95% CI = 0.37–5.93). For males, however, the odds of being depressed were 18.4 times greater for those who were regular users of Group 2 drugs than for those who were not regular users of Group 2 drugs ($p < 0.0001$; 95% CI = 5.01–68.01). The overall predictive ability of this model was 74.9% (Table 3).

Discussion

The prevalence of depression identified in the sample (64.5%) is consistent with previous reports (Unger et al. 1997). A higher prevalence of depression among street-involved females than among their male counter-parts is also a consistent finding in the literature (Adlaf, Zdanowicz and Smart 1996; Unger et al. 1997). Another study found that a previous mental-health diagnosis among females was predictive of poly-substance abuse and suggested that self-medication may be more common among females than males (Kirst, Erickson and Strike 2009). In this same study, "living with friends" was significantly and positively associated with poly-substance abuse for female youths, suggesting peer influence to use drugs may be a factor in poly-substance abuse (Tang, Wong and Schwarzer 1996; Kirst, Erickson and Strike 2009). On the contrary, a pet does not hold the same risk of peer influence to consume drugs. Previous qualitative research has demonstrated that pets may provide motivation for youths to make better and more responsible choices (Rew 2000; Thompson et al. 2006; Bender et al. 2007; Rew 2008; Lem et al. 2013), including decreasing drug use and avoiding arrest or incarceration from drug-related crime in order to avoid separation from the animal (Bender et al. 2007; Lem et al. 2013).

High levels of social support are negatively correlated with depression among street-involved youth (Smart and Walsh 1993), therefore it is possible that pets may confer a similar protective effect. The main outcome of the current study was that pet ownership had a protective association with CES-D-identified depression. This is consistent with Rhoades, Winetrobe and Rice (2014), who found that homeless youths who owned pets scored lower, on average, than youths without pets. Kidd and Kidd (1994) surveyed 52 homeless pet owners and found that 74% of male and 48% of female participants identified their pets as their only source of companionship and love. In addition, among housed women without partners, those who live with a pet have fewer depressive symptoms (Tower and Nokota 2006), and dog ownership is positively associated with greater wellbeing for women (Cline 2010). These findings suggest that pet ownership may be important for the mental health of street-involved youth; however, further investigation is needed to establish causality.

In the current study, when pet ownership and time since youths left home were controlled for, an interaction was identified between gender and Group 2 drug use in relation to their effect on depression among street-involved youths. Among regular users of Group 2 drugs, males were at higher odds of depression than females; however, among non-users, females were at higher odds of depression. Of particular importance may be the finding that males who were regular users of Group 2 drugs were 18 times more likely to be depressed than males who were not regular Group 2 drug users. This points to a sub-population of street-involved youths who may be highly susceptible to depression. Although other studies have identified an association between drug use and depression (Baron 1999), the influence of drug use and gender on depression is an area that warrants further research.

Although results of the current study indicate that as the time since a youth has left home increases, the odds of depression decreases, this finding is not well understood. Possibly, as youths spend more time being street-involved they begin to develop protective mechanisms against depression. In some youth studies, self-reported resiliency has been associated with less social support, and it is suggested that this resiliency comes from independence and self-reliance (Rew et al. 2001; Kidd and Davidson 2007). Lastly, youth who have been on the street for longer periods may not be well represented as they may be lost via attrition due to incarceration, suicide, or institutionalization. Understanding these mechanisms is worthy of further investigation.

The findings of the current study are consistent with those of other studies regarding the association between depression and both participant gender and drug use, and support the validity of the protective association of pet ownership on depression among street-involved youth. The causes of depression in individuals and populations are complex. Nonetheless, this study provides quantitative evidence that pet ownership may play a protective role against depression for street-involved youth. These findings have implications for providing services and support for youths who own pets and have a strong attachment to their pet. However, pet ownership should not be considered a method of intervention. Instead, further investigation is warranted into the roles that pets play in the lives of street-involved youth.

Limitations

Limitations of this study include the sample size required to detect more subtle differences between pet owners and non-pet owners and self-selection by participants in this study. While categorizing both dependent and independent variables was necessary for ease of handling, this process resulted in a loss of information. In addition, information obtained regarding illicit drug use may be prone to social desirability bias. Although the outcome measures of drug use were self-reported and response bias is possible, self-reported use of drugs has been considered valid when there is no motivation by respondents to inaccurately report their use (Babor, Stephens and Marlatt 1987). In this study, the motivation of individuals to inaccurately report drug use was minimized by including assurances of strict confidentiality of any information collected, the right of the participant to refuse to answer any question, and the provision of privacy during survey administration. While a standardized clinical interview may be preferred in order to diagnose depression, the CES-D is a validated measure of depression.

As the present study was cross-sectional in design, causality and temporal associations cannot be determined; however, the approach used was selected for its efficiency, descriptiveness, and ability to detect associations in this new field of study. Indeed, it may be possible that youths with less depression choose to own pets. To assess causality, a longitudinal, prospective study would be required. Finally, because surveys were conducted at drop-in centres, selection bias toward participants who access the services at these locations is possible. Attempts to control for this bias included hiring peer outreach workers to help with recruitment outside of service locations via direct recruitment by peer-worker and word of mouth to obtain a representative sample. To minimize bias by peer-youth workers in recruitment, training and materials were provided to educate the workers on potential biases in research. Although this sample of participants was self-selected, there was no increased incentive for participants to falsely identify themselves as pet owners, as compensation was equal, and the survey required more time to complete for pet owners.

Despite these limitations, we believe that our sample population is representative of the Canadian street-involved youth population, with a demographic profile of street-involved youth consistent with those described in the literature. For instance, gender distribution in the current study was representative of the street-involved youth population, with males outnumbering females by two to one, consistent with previous reports (Smart and Walsh 1993; Canadian Mortgage and Housing Association 2001; Public Health Agency of Canada 2006), and with females more likely to seek shelter or housing due to their vulnerability on the street (Hagan and McCarthy 1997; O'Grady and Gaetz 2009). The reported mean age of youth participants leaving home (15.7 years) and the distribution of participants by ethnicity are consistent with previous reports from other Canadian cities (Adlaf, Zdanowicz and Smart 1996; Hwang 2001;

Ottawa Public Health 2012). The level of education in our sample (61.9% had a Grade 11 education or lower) is consistent with reports from Ottawa and Toronto, where the number of homeless youths who have not completed high school ranges from 63% to 90% (Canadian Mortgage and Housing Association 2001).

Conclusions

In this cross-sectional study, a negative association of pet ownership and depression among street-involved youths in Ontario was demonstrated. In order to establish a causal relationship, longitudinal studies are required, which offers challenges among these often transient youths.

Both quantitative and qualitative research has demonstrated that pet ownership mitigates loneliness among homeless youth (Rew 2000; Rhoades, Winetrobe and Rice 2014). Although pet ownership among this population has its potential liabilities, including limiting youths' ability to obtain shelter and social support services, the potential benefits of pet ownership among this vulnerable population should be considered in future research and programming development associated with street-involved youth. In caring for their pet and placing its needs ahead of their own ("pet before self") (Lem et al. 2013), some youths may recognize the need to care for self. For these youths, it may be a critical opportunity for service intervention and support, and is worthy of further consideration and investigation.

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Note

1. Data are available upon request from Bill O'Grady, Department of Sociology and Anthropology, University of Guelph, Guelph, Ontario, Canada.

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