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Musculoskeletal Flexibility and Quality of Life: A Feasibility Study of Homeless Young Adults in Los Angeles County

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ABSTRACT

International Journal of Exercise Science 11(4): 968-979, 2018. Proper musculoskeletal health is dependent on the efficient inner workings of muscles, tendons, ligaments, joints, and bones. The homeless experience can be physically debilitating to these tissues and anatomical structures. This feasibility study aims to explore how to answer the overarching question: do the lived experiences of homeless young adults negatively affect their musculoskeletal health? Questionnaires were distributed to assess the demographic characteristics, physical activity, health behaviors, and sleep patterns of 40 homeless young adults and 45 university students in Los Angeles County. Participants also completed supervised stretch tests to assess musculoskeletal flexibility. Findings indicate that homeless young adults were less flexible in all four stretch assessments compared to university students. Noteworthy differences were noted with the sit and reach (p=0.050), butterfly (p=0.036), right shoulder (p=0.005), and left trunk twist tests (p=0.041). Analyses of physical activity levels and sleep location within the homeless subgroup suggest a deleterious impact on flexibility. Flexibility assessments are a low cost and sensitive method for measuring degree of musculoskeletal dysfunction of homeless young adults. Preliminary data suggests that the musculoskeletal health of this subgroup is adversely affected by their lived experience. Health services such as yoga or Pilates, in addition to existing case management and mental health services at homeless drop-in centers, may reduce the likelihood of long-term physical disability.

KEY WORDS: Homelessness, built environment, health disparity, disability

INTRODUCTION

In Los Angeles County alone, there are roughly 58,000 individuals experiencing homelessness on a given night, which reflects a 23% increase from 2016 (11). The homeless young adult population (18-24 years old) increased by 64% in 2016, making this age group the fastest growing homeless demographic (1). This rapidly growing population suggests that the pathway to homelessness continues to outpace the efforts of policy workers, grassroots organizations, and community activists to quell the epidemic.

Homeless individuals have significantly higher rates of chronic pain, morbidity, and hospitalization compared to the general public. These higher rates could be attributed to the

physically demanding lived experience of homelessness (12, 16, 17, 23). Short-term injury and long-term disability have a profound impact on access to care, ability to pursue education or employment opportunities, and quality of life. The back and lower extremities of homeless individuals are under particularly high levels of physical stress. In a study by Chen et al., 74% of homeless respondents stated that they were on their feet for more than 5 hours a day (5). Schwarzkopf et al. have also reported that homeless individuals walk an average of 5 miles per day (21). Foot pain can result in drastic range of motion limitations, thus decreasing muscular flexibility and increasing risk for musculoskeletal conditions. Proper musculoskeletal health is dependent on the efficient interworking of muscles, tendons, ligaments, joints, and bones. These structures allow for the body to maintain its form and function despite daily physical challenges.

Homeless adults are more likely to be required to navigate their physical environments by walking, bicycling or skateboarding. However, homeless young adults are less likely to be eligible for age-related transportation benefits or fare discounts. This reliance on the musculoskeletal system for transportation, coupled with a shortage in opportunities for physical rest due to overcrowded shelters and lack of comfortable sleeping arrangements, could lead to cumulative physical stress (13). Over time, the lived experience may be physically crippling for homeless young adults, leading to morbidity and disability by middle age (10, 14, 15).

Increased flexibility directly relates to muscular balance and posture by realigning tissues therefore reducing the effort it takes to maintain posture. Flexibility also increases productivity and efficiency of muscles, which can potentially decrease risk of injury (17). Regular stretching is essential to decreasing the risk of musculoskeletal injury. The American College of Sports Medicine (ACSM) recommends stretching each major muscle group at least two times a week for 60 seconds (18). Static stretching involves repeated movement through a specific range of motion, which increases joint range and prevents loss of motion, thereby reducing muscular stiffness. Furthermore, increased static stretching is shown to have an impact on muscular flexibility and increased range of motion, therefore reducing the risk of injury (2). Circumstances such as sleeping on hard surfaces, carrying heavy loads for hours, and endlessly walking from soup kitchen to shelter may contribute to the muscular injuries homeless individuals face due to these physical demands. Nutrition and mental health are important to overall well-being and can also negatively impact physical health. Homeless young adults may struggle with sociocultural and socioeconomic disadvantages due to their age, employment history and educational attainment.

Since flexibility is critical to musculoskeletal health and wellness by reducing risk for injury, this study aims to satisfy the overarching questions: How does the homeless experience affect quality of life among young adults? Does the homeless experience negatively affect the musculoskeletal health of young adults? To explore the potential impact of the homeless experience, flexibility and health behaviors were assessed and compared between homeless young adults and similarly aged university students.

METHODS

Participants

This study presented herein is a cross sectional comparison of flexibility and health-related behaviors. University students (n=45) were used as the comparison group for homeless young adults (n=40) (Table 1). All participants signed a written informed consent in accordance to the study protocol approved by the Institutional Review Board of Loyola Marymount University. Homeless young adults were invited to participate through in-person recruitment at a homeless youth drop-in center located in Los Angeles County. A $10 gift card to a local eatery was provided as compensation to consenting participants at the drop-in center. University students were invited to participate using recruitment by e-mail, flyers and word-of-mouth. A warm meal and refreshments were provided to consenting participants recruited on the university campus.

Protocol

A paper questionnaire was used to collect self-reported data on participant demographics (e.g. age, sex, height, weight, race/ethnicity, employment status, self-perceived flexibility, physical health, methods of transportation, and dietary habits). The paper questionnaire took approximately 10 minutes to complete. Each participant was given a survey number and his or her names were not included, therefore ensuring confidentiality throughout the entire assessment. Following questionnaire completion, participants were asked to complete a two-minute warm-up consisting of movement in place and then were asked to complete the stretch assessments to determine musculoskeletal flexibility. Flexibility was assessed in-person by trained researchers using standardized methods. The ACSM defines the hamstrings, hip flexors, and calves to be the top three muscle groups that experience tightness (18). In this study, all three muscle groups along with the trunk and back muscles were assessed. Prior to beginning the stretching protocol, participants were given the option to remove their shoes. In addition, participants were recommended to not continue with any stretch that caused pain or discomfort. The following describes the various stretching protocols.

The sit and reach flexibility test targets hamstring and lumbar lower back flexion. The participant started by sitting on the floor with their legs stretched out with the sit and reach machine lying in front. Placing one hand over the other, they then pushed the metal tab as far as they could and were advised to keep their knees as straight as possible while they held the stretch for at least three seconds. The distance stretched indicated the flexibility of their lower back and hamstring muscles, and was measured three times in order to obtain an average, measured in centimeters (9).

The groin test, also known as the butterfly test, targets the adductor muscles. The participant started by sitting on the floor with their soles of their feet touching each other. They were asked to push their ankles as close to their body as possible, while keeping their back straight to avoid bending over. The linear distance from their heels to the groin area of their pants was self-reported by participants using a tape measure. Values were measured in centimeters, meaning a smaller value indicates greater flexibility (9).

Table 1. Demographics of participants.

	Homeless Young Adults (n=40)	University Students (n=45)	P-value
Age (years)			
Mean ± Standard Deviation	21.4 ± 2.3	20.2 ± 1.2	0.003
Missing	2	0	
Height (inches)			
Mean ± Standard Deviation	67.9 ± 3.3	68.2 ± 4.5	0.742
Weight (pounds)			
Mean ± Standard Deviation	158.2 ± 27.8	160.4 ± 34.3	0.748
Gender			
Male	27 (67.50%)	23 (51.11%)	
Female	11 (27.5%)	21 (46.67%)	
Other	1 (2.50%)	0 (0.00%)	
Missing	1 (2.50%)	1 (2.22%)	
Race/Ethnicity			
White	12 (30.00%)	21 (46.67%)	
Hispanic	11 (27.50%)	12 (26.67%)	
Black/African American	8 (20.00%)	8 (17.78%)	
Asian	0 (0.00%)	4 (8.89%)	
American Indian/Alaska Native	3 (7.50%)	0 (0.00%)	
Native Hawaiian/Pacific Islander	1 (2.50%)	0 (0.00%)	
Missing	5 (12.50%)	0 (0.00%)	
Nativity			
California	11 (27.50%)	30 (60.00%)	
Out-of-State	29 (72.50%)	15 (40.00%)	
Level of Education Completed			
Less Than High School	6 (15.00%)	0 (0.00%)	
Some High School	9 (22.5%)	0 (0.00%)	
High School Graduate	15 (37.5%)	0 (0.00%)	
Some College	7 (17.5%)	43 (96.00%)	
2-Year College Degree	3 (7.50%)	0 (0.00%)	
4 Year College Degree	0 (0.00%)	2 (4.00%)	
Employment Status			
Employed	2 (5.00%)	35 (77.77%)	
Retired	2 (5.00%)	0 (0.00%)	
Self-Employed	8 (20.00%)	0 (0.00%)	
Unable to work (health limitation)	3 (7.50%)	0 (0.00%)	
Supported by SSI	2 (5.00%)	0 (0.00%)	
Unemployed	21 (52.50)	2 (4.44%)	
Other	1 (2.50%)	8 (17.77%)	
Missing	1 (2.50%)	0 (0.00%)	

To test trunk flexibility, researchers placed tape in a vertical line along the wall. Participants stood 20cm away from the wall facing forward. The vertical line was parallel to their spine. The participant then extended both arms forward, placing one hand over the other, and then twisted the trunk to reach maximum rotation, holding the stretch for at least three seconds. If the participant's fingertips crossed the vertical line, then the distance between the fingertips and the tape was measured as a positive value in centimeters. If the participant were unable to cross the vertical line, then the distance between the tape and their fingertips was measured as a negative number. Participants were asked to do the exercise twisting the opposite direction (20).

The shoulder stretch measures how close the hands can be brought together behind the back. The participant placed one hand behind the head and over the shoulder, thus reaching for the other hand, which was placed behind the back. Measurements were taken from the left middle fingertip to the right middle fingertip, measured in centimeters. If the fingers could not touch then that indicated a negative score, but if the fingertips overlapped, then a positive score was recorded. The protocol was repeated for the other hand and shoulder (9).

Statistical Analysis

Non-directional associations between demographic characteristics, health-related variables, and flexibility were assessed. Raw data was used to create scatter plots for each stretch test. Visual outliers were identified as being ≥20 cm from the mean and were excluded. No more than 10% of data points were removed from the sample. Independent samples t-tests, ANOVA, and Chi-square analyses were used to examine the relationships between variables across the two participant populations. All analyses were performed using SPSS Version 24 (Armonk, NY, USA).

Well-being and health-related influences were analyzed **u**sing a Chi-square analysis; hunger and food insecurity were examined with education level (Table 2). All participants were asked to report frequency of experiencing hunger, presence of food insecurity, and average number of meals per day. Education levels were collapsed into two categories: 1) high school or less and 2) some college or more. Hunger experienced was ordered as 1) never, 2) sometimes, 3) often, and 4) every day. Only individuals who responded to both questions were included in the sample size. Difficulty affording food was assessed by a yes or no question asking, "Do you experience difficulty affording food?" Numbers of meals consumed per day was ordered as 1) one meal, 2) two meals, 3) three meals, and 4) more than three meals. Not all homeless young adults answered every question.

A Chi-square analysis was used to examine depression as a potential outcome of the following variables that may influence well-being and quality of life: nativity/location of birth (California, outside of California), education level (high school or less, some college or more), bodily pain (little to none, moderate to severe), and sleep amount (4 or less hours, 5-6 hours and 7 or more hours). All variables were self-reported on the paper questionnaire. Participants were asked to report level of depression experienced within the past 4 weeks.

Responses indicating "none" or "very little" were grouped together and responses indicating "moderate," "quite a bit," and "severe" were grouped together.

Overall, given the observed disparity in flexibility among homeless young adults, sleep location and physical activity were examined within this population in order to identify potential relationships with flexibility. Sleep location was determined using the paper questionnaire prompt, "Where did you sleep the previous night?" Responses were then sorted in four categories: indoors, streets, the beach, or a car (Table 4) and analyzed using an ANOVA. Responses were also collapsed into two categories of sheltered (indoors, car) and unsheltered (beach, streets) and analyzed using a t-test.

Table 5 presents a t-test analysis of self-reported intensity and frequency of physical activity with flexibility. Participants were asked on the paper questionnaire to recall and report the frequency of mild, moderate and strenuous physical activity from the past seven days. Examples of mild, moderate and strenuous exercises, in the context of homelessness, were provided with the prompt. The continuous frequency of activity was categorized as either low frequency (0-2 times/week) or high frequency (3 or more times/week).

RESULTS

Among homeless young adults with a high school education or less, 59.3% experienced difficulty affording food, while 88.9% of those with some college education or more experienced difficulty affording food. The 28 homeless young adults with a high school education or less received an average of 2.25 meals per day. The ten homeless young adults that reported at least some college education received an average of 2.00 meals per day. Although the relationships between education and hunger/food insecurity/meal frequency are worth mentioning, the observed statistical associations did not reach significance at an alpha of 0.05.

Nativity, bodily pain and number of nightly hours of sleep did not appear to influence intensity of depression as reflected by Chi-square analyses ($p=0.802$, $p=0.321$, $p=0.187$, respectively). In Chi-square analysis, an association was suggested between depression and level of education with a higher level of education attainment appearing to be related to a more intense experience of depression ($p=0.052$).

As compared to university students, homeless young adults were less flexible in every stretch test (Table 3). Potentially meaningful differences were noted with the sit-and- reach, butterfly, right shoulder, and left trunk twist tests.

Table 2. Chi-square analysis of the relationship between education level and food insecurity for homeless young adults (n=40).

		Education Level		
		High School or Less (n=30)	Some College or More (n=10)	P-value
Hunger Experienced	Never	10 (33.33%)	2 (20.0%)	0.483
	Sometimes	13 (43.33%)	4 (40.0%)	
	Often	3 (10.00%)	3 (30.0%)	
	Everyday	2 (6.67%)	1 (10.0%)	
	Missing	2 (6.67%)	0 (0.00%)	
Difficulty Affording Food	Yes	16 (53.33%)	8 (80.00%)	0.102
	No	11 (36.67%)	1 (10.00%)	
	Missing	3 (10.00%)	1 (10.00%)	
Meals Per Day	One	6 (20.00%)	3 (30.00%)	0.631
	Two	11 (36.67%)	3 (30.00%)	
	Three	9 (30.00%)	1 (10.00%)	
	>Three	2 (6.67%)	1 (10.00%)	
	Missing	2 (6.67%)	2 (20.00%)	

Table 3. Average flexibility measures between university students and homeless young adults (t-test).

Flexibility Tests (cm)	Homeless Youth Adults (n=40)	University Students (n=45)	P-value
Sit and Reach	26.20 ± 9.01	29.90 ± 8.04	0.050
Butterfly	17.83 ±7.29	14.57 ± 6.57	0.036
Left Shoulder	0.59 ± 9.55	2.18 ± 6.37	0.390
Right Shoulder	2.42 ± 7.54	6.55 ± 5.05	0.005
Left Trunk Twist	8.89 ± 7.96	10.92 ± 9.37	0.041
Right Trunk Twist	12.22 ± 8.23	13.35 ± 9.42	0.574

Using an ANOVA, average flexibility for each stretch test was stratified by sleep location to determine the potential for heterogeneity (Table 4). Noteworthy differences were observed between sleep location and left trunk flexibility and right trunk flexibility. Findings did not increase in significance (sit and reach: p=0.892, butterfly: p=0.364, left shoulder: p=0.840, right shoulder: p=0.730, left trunk: p=0.378, and right trunk: p=0.059) after collapsing sleep location into two categories (sheltered, unsheltered).

Table 4. Average flexibility measures regarding sleep location within homeless young adults (ANOVA).

Stretch Type (cm)	Sleep Location				P-value
	Indoor (n=8)	Streets (n=22)	Beach (n=7)	Car (n=3)	
Sit and Reach	24.95±4.71	26.65± 10.59	23.94±5.12	30.67±12.99	0.740
Butterfly	21.43 ±6.27	16.76 ±8.03	18.43 ±6.43	15.50 ±5.41	0.489
Shoulder- Left	-0.13±10.06	0.71±8.37	-0.71±7.45	0.67±13.65	0.965
Shoulder-Right	1.00 ±5.03	3.05 ±7.70	5.00 ±3.74	3.33 ±9.29	0.779
Trunk- Left	2.88±7.22	9.50±7.56	10.17±4.26	18.33±9.07	0.021
Trunk-Right	4.75 ±5.34	13.33 ±8.79	13.50 ±8.50	18.00 ±2.83	0.054

Homeless young adults that engaged in strenuous intensity physical activity at high frequency showed higher flexibility in the trunk region compared to those who engaged less often at the same intensity (Table 5). Other analyses did not yield findings that were statistically significant, likely due to sample size limitations. However, it is worth noting that the regions that appear to benefit from higher frequencies of mild and moderate exercise are the groin and trunk.

Table 5. Flexibility measures regarding level of physical activity within homeless young adults (n=40).

Level of Physical Activity	Low Frequency 0-2 times/week n, average flexibility (cm)	High Frequency 3+ times/week n, average flexibility (cm)	P-value
Mild n=38			
Missing n=2			
Sit and Reach	14, 24.25 ± 9.76	24, 25.28 ±15.50	0.597
Butterfly	14, 22.64 ± 8.45	23*, 15.98±6.33	0.494
Shoulder-Left	14, -0.50 ± 10.95	24, 0.94 ±9.50	0.829
Shoulder-Right	14, 3.43 ± 10.60	24, 4.29±8.43	0.788
Trunk-Left	13 *, 5.46 ± 1.43	24, 11.13 ±7.90	0.404
Trunk-Right	13 *, 8.15 ± 11.44	24, 13.75±8.59	0.299
Moderate n=39			
Missing n=1			
Sit and Reach	15, 17.51±16.94	24, 29.24±8.13	0.255
Butterfly	15, 22.17 ± 7.31	23 *, 15.61 ± 7.09	0.745
Shoulder-Left	15, -3.73 ± 9.51	24, 2.35 ± 9.97	0.892
Shoulder-Right	15, 1.47 ± 7.06	24, 5.04 ± 10.37	0.431
Trunk-Left	15, 5.40 ± 7.73	23 *, 11.65 ± 9.79	0.442
Trunk-Right	15, 9.00 ± 11.25	23 *, 13.57 ± 8.92	0.248
Strenuous n=39			
Missing n=1			
Sit and Reach	17, 25.05 ± 9.50	22, 22.48 ± 16.00	0.403
Butterfly	16 *, 18.47 ± 8.46	22, 18.00 ± 7.45	0.527
Shoulder-Left	17, 1.29 ± 10.99	22, -0.98 ± 9.53	0.836
Shoulder-Right	17, 4.41 ± 10.12	22, 3.09 ± 8.81	0.863
Trunk-Left	16 *, 7.81 ± 12.28	22, 10.18 ± 6.84	0.022
Trunk-Right	16 *, 10.67 ± 12.53	22, 12.55 ± 7.94	0.052

*Outlier removed.

DISCUSSION

The majority of studies published on homeless young adults focus on substance abuse and mental health (3,4, 6, 19). Studies that have addressed the physical and functional health of homeless adolescents and young adults have largely been conducted outside of the United States (14, 22). This study is unique in its approach to understanding how the homeless experience negatively affects physical health and mental well-being of young adults in the

United States. Findings from this study suggest that the experience of depression is greater among homeless young adults with higher levels of education. While education is often viewed as a solution to socioeconomic crisis, these particular young adults may feel a greater sense of despair at not being able to use their education as a means to gain socioeconomic stability. The physical manifestation of this stress on musculoskeletal health (e.g. activation of the fight-or-flight response, injury, more intense and prolonged bouts of walking to seek employment) should be explored.

The findings presented herein also suggest that, among young adults, the musculoskeletal architecture of the groin, shoulder and back is negatively affected by the homeless experience. Sleep location was noted as a possible mediator of flexibility, with the most flexible subgroup of homeless young adults being those that identified their sleep location as a vehicle. This suggests that one's physical comfort level, the sleep environment itself, and perhaps feeling safe or in control of one's surroundings (mental or emotional stress) are important variables in regards to positive sleep health. It also may indicate a higher level of socioeconomic status or greater access to resources that would be supportive of physical health and quality of life. A study of pain in homeless adults in the United Kingdom did not detect an association between sleeping in sheltered versus unsheltered locations (7). However, the study was conducted in an older age group (average age of 42 years) with potentially greater heterogeneity in number of years spent homeless and types of lived experiences. Additional research is needed across the age spectrum to explore the potential relationships between musculoskeletal pain, trajectory of homeless experience, and type of sleep environment.

Researchers found significant differences between the right shoulder and left trunk flexibility when comparing homeless young adults to university students. However, there were no differences with left shoulder and right trunk flexibility when the two study populations were compared. Assuming the majority of both homeless young adults and university students are right dominant and carry multiple bags at various loads (i.e. backpacks, duffle bags, sleeping bags and tents) for extended periods of time, then there could be a difference between right and left muscle flexibility. More information regarding the following variables is needed: the handedness of the two populations, weighted inventory of each load being carried, and the duration of time it is carried. These variables could be used to compare homeless young adults' musculoskeletal health to the weight of their personal loads.

Potential heterogeneity was noted in flexibility according to intensity and frequency of physical activity. Individuals participating in more strenuous activities at higher frequency may be better conditioned and a flexibility advantage may be conferred as a result of conditioning. Additional strength and conditioning research and more formal musculoskeletal assessment (body composition analysis using dual-energy X-ray absorptiometry, isokinetic dynamometry) are needed to explore differences in physiology and functional capacity across individuals.

Collectively, these observations may serve as the impetus for development of preventive health services directed to homeless young adults to reduce the likelihood of future disability

and comorbidity. Drop-in centers provide case management, counseling, and access to the Los Angeles County Department of Mental Health's community clinics. Those experiencing depression have access to various resources that can help manage its adverse effects; however, there may be a need to look more closely at the source of depression (chronic versus acute/situational) and the nature of feelings of despair. While drop-in centers often employ successful strategies to address malnutrition and counseling needs, there are little evidence-based interventions to more appropriately address the musculoskeletal health of homeless young adults and intervene on future health conditions. In a study of Canadian adults living in a shelter, using general exercise equipment did not resolve deficits in flexibility (8). This underscores the need for exercise interventions specifically focused on flexibility and musculoskeletal injury.

This study is limited in generalizability given that the recruited homeless young adults were seeking services at a drop-in center. These participants were actively attending the drop-in center in hopes of gaining knowledge from its diverse services and may be more likely to seek support services for their physical and mental health. Additionally, this study did not collect information on the trajectory of each participant's experience with being homeless.

It was difficult to maintain a consistent protocol when assessing flexibility among homeless young adults. This may not be unique to homeless young adults and could be a recurring theme in physical assessments of individuals that have been disenfranchised or that feel vulnerable. Some participants at the drop-in center did not want to complete the two-minute warm up because they considered it to be a waste of energy. They expressed that they constantly transport themselves across the city to find shelter, food, and services and did not need to warm-up. The hamstring flexibility test used a sit and reach box where participants are typically asked to remove their shoes prior to assessment. All participants were given the option of taking off their shoes, however, the majority of homeless young adults did not remove their shoes for the test. All but 10 of the university students chose to take off their shoes. The homeless young adults might have been uncomfortable with foot hygiene or odor. They are given a limited number of clean socks at the drop-in center and could have potentially gone days without a change of socks. Social embarrassment could have influenced their decision to keep their shoes on throughout the flexibility tests. This may have created an experimental bias as usage of shoes will lead to a conclusion of decreased flexibility during the sit and reach test. During the groin flexibility test, participants were asked to measure the linear distance between the groin area of their pants and the back of their heels. Since this measurement was self-assessed, there may have been human error. However, the self-assessment was observed and guided by a trained researcher so this error may be minimal. Twenty-two homeless young adults (55%) and 21 university students (47%) wore jeans at the time of assessment. Jean fabric has the potential to limit movement and range of motion, which could appear as reduced flexibility. It is assumed that errors from this assessment would be non-differential as both the homeless young adults and university students completed a self-assessment and roughly equal frequencies wore jeans.

Based on the findings from this study, a future study should aim to collect more detailed information on the homeless experience (e.g. number of months or years homeless, amount of time spent sheltered or unsheltered, regular access to a vehicle). A qualitative or mixed-methods study of the experiences of depression and psychosocial stress as well as the utilization of resources and coping strategies would be beneficial to understanding the allostatic stress load among homeless young adults. Homeless young adults would also have the opportunity to share qualitative details about their perceived psychosocial and health barriers. The relationships noted in this study should be analyzed in a larger and more diverse population of homeless young adults. It would be important to more fully explore the potential sociocultural, geographic, and resource-related mediators of the relationship between the homeless experience and musculoskeletal health outcomes.

The lived experience of homeless young adults has a negative impact on sleeping patterns, dietary intake, and mental health, which in turns leads to deficits in flexibility. Shelters and drop-in centers should adopt interventions that specifically target musculoskeletal health in order to reduce the risk of short-term injury and long-term disability.

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