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## The Interplay between Physical Activity and Psychological, Social, and Perceived Health in Juvenile Corrections Facilities

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### Abstract

Physical activity (PA) and its contributions to wellbeing are understudied among incarcerated youth. We used 2019 Minnesota Student Survey data to describe PA rates and test PA's associations with indicators of psychological, social, and perceived health for adolescents in juvenile corrections facilities (JCFs). Participants ( $n = 265$ , 29% female,  $m_{age} = 15.4$  years) self-reported days of 60 minutes of PA in the previous week. They also reported how often they experienced joy and energy and built trusting peer relationships, as well as how they perceived their overall health and symptoms of anxiety and depression. We calculated descriptive statistics and tested PA's associations with psychological, social, and perceived health variables among the full sample, then stratified by sex, with unadjusted and age-adjusted models. Female and male youth averaged over 5 days of 60 minutes of PA. PA was positively, significantly associated with experiencing joy and energy, building trusting peer relationships, and having better perceived health, though sex-related differences emerged. PA was unassociated with anxiety and depression. Results suggest PA rates are high in JCFs, though quality remains unclear. While PA is positively associated with certain developmental outcomes for incarcerated youth, PA alone seems insufficient for mitigating their mental health concerns.

### Keywords

adolescent health; juvenile incarceration; mental health; physical activity; positive youth development; well-being; youth

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In 2019, nearly 20,000 youth between the ages of 10 and 17 were arrested in Minnesota (Charwood et al., 2020). For 8,346 of these young people, their arrests led to placement in a juvenile corrections facility (JCF), or a secure, residential detention facility operated by the Minnesota Department of Corrections (MN DOC; Charwood et al., 2020). Rates of youth incarceration are similar throughout the United States, amassing to over 600,000 youth being incarcerated nationwide each year (American Civil Liberties Union, n.d.; Children's Defense Fund, 2021).

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Concerningly, studies indicate that many young people who are incarcerated experience significant psychological, social, and physical health challenges, some of which persist into adulthood (Barnert et al., 2016; Brown et al., 2020). In these studies, scholars have begun to document the extent of such health risks among adolescents in JCFs: they note that though anxiety, depression, and other health concerns are prevalent in this population, young people navigating the legal system often do not receive the health services they need (Brown et al., 2020). While researchers have made some progress uncovering the extent of mental health challenges for adolescents in JCFs, there remains much to learn (Beaudry et al., 2021). Furthermore, little is known about other, subclinical areas of psychosocial health or positive health behaviors among young people in JCFs (Brown et al., 2020). In particular, little research has examined the effectiveness of health promotion strategies in mitigating risk for poor psychological, social, and physical health outcomes in these settings (Brown et al., 2020). Indeed, research involving youth in JCFs has focused heavily on risks to their development, yet more work is also needed to illuminate strategies that support their wellbeing (Martins et al., 2021).

One health promoting behavior deserving of more attention among incarcerated youth is physical activity (PA), defined as human movement that expends energy above a resting level (U.S. Department of Health and Human Services, 2018). PA is a key component of health for adolescents and facilitates a range of psychological, social, and physical health benefits (Hosker et al., 2019; U.S. Department of Health and Human Services, 2018). Adolescents engage in PA via many different modes and in a variety of contexts, including unstructured PA (e.g., activities of daily living, active transportation, playing games with friends), planned exercise (e.g., lifting weights, yoga classes), PA programs or lessons (e.g., dance, martial arts), and sports (U.S. Department of Health and Human Services, 2018). In general, higher PA is linked to improved holistic well-being, including decreased risk and severity of anxiety and depression (Biddle et al., 2019; Pascoe et al., 2020). In addition to reducing mental health concerns, PA participation produces positive psychosocial outcomes for general populations of youth, such as giving youth opportunities to feel good about themselves, build positive relationships with their peers, and develop healthy habits that promote physical and mental health that carry forward from adolescence into adulthood—some evidence suggests that the beneficial effects of PA are stronger for adolescents when PA is done in a social, structured program (Holt et al., 2016; Petitpas et al., 2005). These potential benefits make PA and sport programs of keen interest to scholars and practitioners working with a positive youth development lens, or one that emphasizes the potential of all youth to thrive when they are given the psychological, social, and environmental supports they need (Lerner et al., 2005).

In addition to research in the general population, existing scholarship has shown the potential promise of PA and sport-based programs delivered in detention facilities (e.g., Martins et al., 2021). For example, Hapeta and colleagues' (2022) culturally tailored sport intervention for M ori youth in New Zealand juvenile detention facilities helped young people feel connected to peers and facilities staff. Other studies of PA programs in international prison contexts (e.g., in England, Wales, Portugal, and the United States) have also demonstrated holistic benefits, such as reducing participants' anxiety, increasing their levels of energy, and improving their relationships with their peers (Jacobs et al., 2022;

Jump & Blakemore, 2022). Such findings are promising, yet questions remain regarding PA, health, and development for incarcerated youth (Martins et al., 2021), particularly given some evidence that incarcerated youth may be falling behind the U.S. Department of Health and Human Services' guidelines for adolescents of at least 60 minutes of PA every day (Brusseau et al., 2018; U.S. Department of Health and Human Services, 2018).

As stated, incarcerated youths' PA levels and psychological, social, and physical health—during and before or after their incarceration—have not been well-documented in research (Martins et al., 2021). For example, estimates of how many youth in American JCFs are involved in specific PA or sport-based programs during their incarceration are unavailable, though this number is about 16% in the United Kingdom (Woods et al., 2017). One prior study, with a sample of 68 adolescents incarcerated in the Southwest region of the U.S., found that youth averaged around 45 minutes of moderate-to-vigorous physical activity per day, or slightly below the recommended 60 minutes per day (Brusseau et al., 2018). It is unclear, however, how much PA youth in JCFs engage in during prescribed recreational time, time simply spent outdoors, or other time used for PA (e.g., free time spent lifting weights or shooting baskets), as well as what kinds of activities they are participating in: JCFs provide little public documentation of the type or structure of PA they offer. This incomplete or otherwise concerning picture means that policymakers and practitioners have little quantitative evidence to use as they make decisions to try to optimize incarcerated youths' PA and health.

Relatedly, PA has a complicated existence in carceral settings for both youth and adults: though stereotypes of incarceration suggest people in prison spend excessive time exercising, these may be unfounded (Jump & Blakemore, 2022). Furthermore, prison staff have historically used restrictions of PA and free time as punitive measures for youths' behavior (Jacobs et al., 2022). Also, while existing PA program studies yield important data, these studies have had very small sample sizes, often specific to one facility (Martins et al., 2021). Broader studies, with larger samples, that incorporate assessments of both PA and psychological, social, and overall health are needed to guide policy and practice. Such studies are necessary to protect and enhance access to PA opportunities for youth in JCFs. Better information about PA in JCFs, as well as the contributions of PA to wellbeing for incarcerated young people, can help inform decisionmakers about the potential for PA to support health (Martins et al., 2021).

Thus, our study had two purposes. First, we wanted to describe PA among adolescents in JCFs and examine differences based on sex. We decided to investigate sex-related differences given prior literature that: far more male youth are incarcerated compared to female youth, in the general population, male youth are typically more active than female youth (though this has been unexamined in JCFs), and that there are sex-related differences in mental health outcomes (Guthold et al., 2020, Espinoza et al., 2013). We wanted to determine overall PA rates, as well as calculate how many adolescents in JCFs were meeting U.S. Department of Health and Human Services' PA guidelines of at least 60 minutes of PA every day (2018). Second, we sought to explore how PA was associated with psychological, social, and holistic health in this understudied population. Specifically, we looked at how PA was associated with youth building positive peer relationships, feeling joy and energy,

and assessing their overall perceived health, as well as how PA was associated with clinical mental health indicators (i.e., of anxiety and depression).

## Methods

We used data from the 2019 Minnesota Student Survey (MSS), which is a survey distributed to adolescents throughout (Minnesota Department of Education, n.d.). The MSS is distributed every three years, when the Minnesota Departments of Education, Health, Human Services, and Public Safety invite public schools, juvenile corrections facilities, and alternative learning centers to participate (Minnesota Department of Education, n.d.). The purpose of the cross-sectional, self-report survey is to monitor young people's health and health-related behaviors. In 2019, there were 27 JCFs in Minnesota; 17 of these opted to participate in the Minnesota Student Survey. Participation was entirely voluntary, and responses are completely anonymous. The University of Minnesota Institutional Review Board determined our study was not human subjects research due to the use of existing, de-identified data.

## Participants

Table 1 describes our sample, which included 266 adolescent participants (% female = 29) in 17 JCFs in Minnesota. Participants were 11–21 years old ( $m_{age} = 15$  years), and most were in the eighth through eleventh grades. Most participants (40% of female and 26% of male adolescents) identified as multiple races/ethnicities. Among those who only selected one racial or ethnic category, most selected White (25% of female and 34% of male participants), Native American or Alaska Native (21% of female and 11% of male participants), or Black, African or African American (10% of female and 22% of male participants).

## Measures

### Independent Variable

**Physical Activity.:** PA was assessed using a single item emanating from the Youth Risk Behavior Surveillance System, which asks respondents how many days in the past week that they were physically active for at least 60 minutes (Kann et al., 2000). Response options ranged from zero to seven days.

### Dependent Variables: Psychological, Social, and Perceived Health

**Experiencing Joy and Energy.:** As one indicator of psychological health, we used a single item indicating how often young people in JCFs spent time doing activities from which they gained joy and energy. The item asked, “When you spend time doing activities outside of the regular school day, how often do you do something that gives you joy and energy?” The item was scored using a four-point Likert scale ranging from rarely (one) to very often (four), treated continuously, and was developed, tested, and validated specifically for the MSS (Lamm et al., 2018).

**Anxiety.:** As another indicator of psychological health, we examined anxiety. Anxiety was assessed using the Patient Health Questionnaire for Anxiety and Depression (PHQ-4)

(Kroenke et al., 2009). The PHQ-4 is a short, validated instrument that uses two items to screen respondents for anxiety symptoms by asking how often in past two weeks participants have been bothered by feeling nervous, anxious, or on edge and how often in the past two weeks they have been bothered by not being able to stop or control worrying. Response options for each item include 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day). We followed Kroenke and colleagues' (2009) recommendation to sum these items and consider a score of 3 or higher across both items to indicate a clinical cut point that warrants further evaluation of anxiety symptoms.

**Depression.:** As another indicator of psychological health, we considered depression. Depression was also assessed via the PHQ-4 (Kroenke et al., 2009). Two items screened for depressive symptoms by asking how often in the past two weeks participants have been bothered by little interest or please in doing things and how often in the past two weeks they have been bothered by feeling down, depressed, or hopeless. Response options for each item include 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day). We followed Kroenke and colleagues' (2009) recommendation to sum these items and consider a score of 3 or higher across both items to indicate a clinical cut point that warrants further evaluation of depressive symptoms.

**Developing Trusting Peer Relationships.:** As an indicator of social health, we used one item regarding how often young people in JCFs spent time developing trusting relationships with their peers. The item asked, "When you spend time doing activities outside of the regular school day, how often do you develop trusting relationships with peers your own age?" The item was scored as a continuous variable using a four-point Likert scale ranging from rarely (one) to very often (four) and treated continuously. This item was also developed, tested, and validated for the MSS based on other measures of positive youth development (Lamm et al., 2018).

**Perceived Health.:** As an indicator of holistic health, we looked at youths' own perceptions of their overall health. For perceived health, we used a single continuous item, emanating from the World Health Organization. The item asked, "How would you describe your health in general?", which was followed by five response options: "Poor", "Fair", "Good", "Very good", and "Excellent" and treated continuously (de Bruin et al., 1996). Higher scores indicated better perceived health.

**Demographic Variables—**We examined several demographic variables to describe our sample of youth in JCFs, including race and ethnicity and age (Table 1). Race and ethnicity was assessed with a single question with seven racial and ethnic categories, asking participants to check all that apply. Participants also self-reported age in years.

**Data Analysis—**We conducted all analyses using RStudio for Mac, Version 2022.12.0.353 (Posit Team, 2022). We calculated frequencies and descriptive statistics for all independent, dependent, and demographic variables, stratified by sex assigned at birth (Table 1). Since our first purpose was to describe PA among youth in Minnesota's JCFs, we examined PA several ways. We calculated the average number of days in the previous week participants reported doing at least 60 minutes of PA, the proportion of participants reporting each

number of days, and the percentage of participants who reported meeting PA guidelines for adolescents—that is, among participants who were 17 years old or younger, we calculated how many reported doing at least 60 minutes of PA on all seven days of the previous week (U.S. Department of Health and Human Services, 2018).

Next, we tested regression models using PA as our focal independent variable and our psychological, social, and perceived health variables as dependent variables; we tested separate regression models for each dependent variable. We used linear regressions for the dependent variables of experiencing joy and energy, developing trusting peer relationships, and perceived health because these variables were measured continuously and relatively normally distributed; we used logistic regressions for anxiety and depression, since we dichotomized each per meaningful clinical cut points (Kroenke et al., 2009). First, we tested unadjusted models using PA as an independent variable, considering the entire sample, and including no control variables. Second, we adjusted models for age and sex to account for their potential confounding effects. We calculated unstandardized regression coefficients for our continuous dependent variables ( $B$ ) so that we could interpret estimates in units of the dependent variable (i.e., days of at least 60 minutes of PA in previous week), and we calculated odds ratios for our categorical dependent variables (anxiety and depression). We calculated 95% confidence intervals (CIs) and standard errors (SE) to indicate uncertainty around our estimates. Finally, we calculated R-squared for our adjusted linear models and pseudo R-squared for our adjusted logistic models to indicate overall variance explained in dependent variables by PA, age, and sex. Then, we repeated our series of linear and logistic models after stratifying our sample by sex, given aforementioned sex-related differences in incarceration, PA, and mental health.

We used listwise deletion to handle missing cases, and we used a larger  $p$ -value  $< .05$  to indicate statistical significance given the exploratory nature of this study. We did not adjust for race and ethnicity in our logistic models, following Neal (2008) and VanderWeele and Robinson's (2014) recommendations to use race and ethnicity judiciously and as pertinent to research questions in regression models.

## Results

### Descriptive Statistics

Over 60% of female adolescents and over 50% of male adolescents in JCFs in Minnesota reported meeting PA guidelines and doing at least 60 minutes of PA on all seven days of the previous week. On average, female adolescents reported at least 60 minutes of PA on 5.8 days ( $sd = 1.8$  days) of the previous week; male adolescents averaged 5.2 days ( $sd = 2.3$  days).

Most participants reported “somewhat often” doing activities in which they experienced joy and energy (range = 1–4;  $m_{\text{female}} = 2.4$ ,  $sd = 1.0$ ;  $m_{\text{male}} = 2.6$ ,  $sd = 1.0$ ) and built trusting peer relationships (range = 1–4;  $m_{\text{both}} = 2.9$ ,  $sd = 1.0$ ). Most participants also reported having good or excellent perceived health (range = 1–5;  $m_{\text{female}} = 3.4$ ,  $sd = 1.0$ ;  $m_{\text{male}} = 4.0$ ,  $sd = 1.0$ ). Over 56% of female adolescents and 32% of male adolescents screened positive for needing further evaluation of anxiety symptoms. More than 48% of female adolescents

and 25% of male adolescents screened positive for needing further evaluation of depressive symptoms.

**Regression Models Testing Associations of PA with Psychological, Social, and Perceived Health for Full Sample**—Our unadjusted, unstratified regression models (Table 2) yielded positive, significant associations between PA and youths' reports of experiencing joy and energy, as well as between PA and developing trusting peer relationships. These results held when we adjusted models for age and sex. We observed the same pattern for perceived health, where higher PA was positively and significantly associated with better perceived health for youth in JCFs in unadjusted and adjusted models. PA was not significantly associated with odds of meeting clinical criteria for further screening for anxiety or depression in adjusted or unadjusted models.

**Regression Models Testing Associations of PA with Psychological, Social, and Perceived Health for Female Adolescents**—Relationships between PA and psychological, social, and perceived health variables among adolescents in JCFs differed by sex (Table 3). For the 77 female adolescents in JCF in our sample, PA was unrelated to their reports of experiencing joy and energy, developing trusting peer relationships, perceived health, and odds of meeting clinical criteria for further screening for anxiety or depression. Results were null in unadjusted models and in models adjusted for age.

**Regression Models Testing Associations of PA with Psychological, Social, and Perceived Health for Male Adolescents**—Among the male adolescents in JCFs, we observed significant, positive relationships between PA and experiencing joy and energy, developing trusting peer relationships, and perceived health that remained after we adjusted for age (Table 4). PA was not significantly associated with odds of meeting clinical criteria for further screening for anxiety or depression in unadjusted or age-adjusted models.

## Discussion

We met our purposes of describing PA among adolescents in JCFs in Minnesota and determining how PA associated with indicators of psychological, social, and overall perceived health. In unstratified analyses and analyses among only male adolescents, PA levels were high and associated with youth experiencing joy and energy, developing trusting peer relationships, and having better perceived health. We did not observe these associations for female adolescents, and PA was unrelated to clinical mental health indicators for male and female adolescents. Our study generates important initial findings for researchers of health behaviors and outcomes for youth in correctional facilities, as well as yields considerations for juvenile justice service providers. Although we discuss ways to enhance PA and psychological, social, and perceived health among youth in JCFs, we present our suggestions knowing that the most effective way to support vulnerable youths' health is likely to keep them out of the justice system in the first place (Chisolm, 2017).

Encouragingly, PA levels were quite high in our sample. More than 50% of our participants reported meeting PA guidelines for adolescents and averaged above five days of sufficient PA in the previous week, whereas national estimates of non-incarcerated adolescents

meeting PA guidelines are as low as 23% (Physical Activity Alliance, 2022). This high level of self-reported PA was somewhat unsurprising, as MN DOC policy mandates that JCFs offer youth at least one hour per day of large muscle activity and one hour of structured leisure activities (Minnesota Department of Corrections, 2017). However, not all youth in our sample were meeting this mandate nor public health PA guidelines: among male adolescents, for example, 17 participants reported no days of at least 60 minutes of PA in the previous week. This could point to variability in PA practices and policy adherence, leaving some youth underserved. Beyond the one hour of large muscle activity and one hour of structured leisure, MN DOC policies make no further requirements of JCFs, thus, the content and quality of incarcerated adolescents' PA is likely variable across institutions. That is, the MN DOC does not specifically require JCFs to provide PA equipment, high quality PA spaces, or trained PA instructors or coaches (Minnesota Department of Corrections, 2017). Thus, while levels of PA seem high for youth in JCFs, the quality of their PA experiences remain unclear. Furthermore, site inspections of JCFs in Minnesota indicate that not all facilities are consistently offering mandated PA time or tracking the kinds of activities they provide (Herbert 2021; Herbert, 2022a; Herbert, 2022b; Herbert 2022c). The COVID-19 pandemic has made offering PA experiences for youth in JCFs even more difficult since 2019, as limited spaces that allow for socially distanced PA and staffing shortages present major challenges (León et al., 2022).

Our PA findings and what we know about MN DOC PA policies leave us with several recommendations for other researchers and JCF stakeholders. Based on these high self-report PA rates among adolescents in JCFs, researchers should further explore PA as a health-supporting behavior for these youth. Additionally, to confirm self-report data, researchers should strive to incorporate other measurement approaches for evaluating quantity, quality, or youths' satisfaction with PA in JCFs (particularly among those not participating in a specific PA program). These might include accelerometry, heart rate monitoring, or direct observation, though we acknowledge the logistical difficulties of observational research in JCFs (Brusseau et al., 2019). Additionally, we urge individuals and institutions in power (especially funding decision makers) to adopt explicit and uniform policies that ensure all JCFs have equipment, space, and personnel to make sure that youth have high quality, as well as a high quantity of, PA opportunities.

We were also encouraged to find that PA levels were significantly related to youths' levels of experiencing joy and energy, developing trusting peer relationships, and having better overall perceived health. This suggests PA contributes to healthy development among youth in Minnesota's JCFs, and it implies that PA helps facilitate such healthy development whether or not they are in a specific PA or sport program. PA is consistently, positively, and significantly associated with psychosocial developmental benefits among youth in general and groups of marginalized youth, including in Minnesota (Espinoza et al., in press). In PA contexts, young people can feel invigorated, make close friends, and feel healthy, and these aspects of positive development can be especially meaningful for youth when transitioning from JCFs into their communities (Moore et al, 2013). For example, young participants told Moore and colleagues (2013) that being able to build positive relationships was a major challenge as they navigated reentry into the community. Being able to practice building trusting peer relationships while incarcerated—through PA—may equip young

people with skills they need to create trusting friendships upon reentry (Martins et al., 2021). Furthermore, the PA habits that young people build while incarcerated may help them remain active, use PA as a means of feeling invigorated and healthy, and benefit their holistic health during reentry and throughout the lifespan (e.g., García-Hermoso et al., 2022; Jacobs et al., ahead of print; Martins et al., 2021). Thus, again, our recommendations for JCF decision makers are to protect and enhance the quantity and quality of PA opportunities for incarcerated adolescents. We also recommend that decision makers support and fund pro-social activities, like PA, for young people transitioning from incarceration into the community.

We were somewhat surprised about the sex-related differences in our findings. That is, once we stratified analyses by sex, higher PA was significantly associated with experiencing joy and energy, developing trusting peer relationships, and experiencing better perceived health for male adolescents, but not for female adolescents. Several limitations of our study could have led to our null results, including a relatively small sample of female adolescent participants and consistently high PA levels within the sample of female adolescents. Much more common are findings that PA contributes to positive psychosocial outcomes for male and female adolescents (Biddle et al., 2019; Spruit et al., 2016). However, given sex-related differences in childhood maltreatment and pathways to incarceration for female and male adolescents, it may be that elevated rates of trauma, exposure to violence, and mental health concerns among female adolescents make PA less protective for them (Baidawi et al., 2023; Stewart et al., 2020). An important area for future research will be developing specific strategies, activity-based and otherwise, to support incarcerated female adolescents' wellbeing. Additionally, researchers should continue to investigate sex-related differences in health-promoting behaviors and mental health among incarcerated youth: failing to stratify analyses by sex may mask important, discrepant findings.

We were also surprised by the lack of relationships we observed between PA and anxiety and depression. Among our sample of adolescents in Minnesota's JCFs, self-reported PA in the past week was unassociated with meeting clinical criteria for concerns of anxiety or depression, whether or not we controlled for or stratified by sex. In general populations, higher PA is consistently and moderately linked to lower odds of anxiety and depression among adolescents, and PA itself can be an effective treatment component for mental health disorders (Ahn & Fedewa, 2011; Biddle et al., 2019). However, many of the adolescents in our sample screened positive for concerns for anxiety and depression, compared to the general population: rates of depression concerns among female adolescents in JCFs were about 20% higher than those of MSS participants in public schools, and 6–10% higher among male adolescents (Minnesota Department of Human Services, 2019). Rates of anxiety were also considerably higher for adolescents in JCFs than in public schools (Minnesota Survey Interagency Team, 2019). The elevated rates of mental health concerns among adolescents in JCFs, which align with previous findings, reflect some of the difficulties they may face (Stewart et al., 2020). Incarcerated young people experience trauma, violence, poverty, structural and systemic racism, and related health disparities (Chisolm, 2017; Rodriguez, 2013). These cumulative disadvantages take tolls on their mental health and require more than just individual-level PA to address. That is, PA may help adolescents in JCFs gain energy, enjoy time with friends, and feel healthy, but PA

alone is insufficient to counteract the multitude of stressors they encounter and mental health burdens they bear. In addition to ensuring high quality PA experiences for youth in JCFs, policy makers should strive to increase access to mental health services and multisectoral supports for these adolescents.

Our study had additional limitations that may have affected our results. First, we used a cross-sectional, anonymous survey designed to understand general health and wellbeing of students across the state. Thus, we were missing information that may have helped us better understand the experiences of young people in JCFs. For instance, we are unsure how long MSS participants in JCFs had been incarcerated, which specific JCF each participant was in, and what PA opportunities existed in the JCF where they resided. Average length of stay in JCFs in Minnesota is between two and 18 days, but some youth are in JCFs for considerably longer (Juvenile Justice Report–Minnesota, n.d.). Also related to timing, the items we used to capture self-report PA and anxiety and depression referenced different time frames. That is, we used an item assessing PA in the past seven days, whereas items assessing symptoms of anxiety and depression referenced the past two weeks. Thus, we are unsure of PA levels and anxious and depressive symptoms outside of these time frames, and we do not know how those timeframes related to their period of incarceration—an important omission. While our sample size was relatively large for a study of health-promoting behaviors among adolescents in JCFs, we still know little about incarcerated young people’s health, particularly for female adolescents. No documentation is available that clarifies why 17 out of 27 JCFs in Minnesota decided to participate in the MSS, whereas 10 facilities were not involved: it is unclear whether the 10 facilities chose not to participate or whether they were not recruited to participate. Future researchers may wish to improve upon these limitations by using survey items written specifically for youth in JCFs, capturing key variables over time, and focusing specifically on female adolescents’ experiences.

## Conclusion

Our study offers takeaways for researchers, decision-makers, and advocates for youth in JCFs. We used a strengths-based approach to examine PA and its correlates in an understudied population, whereas little research examines health-promoting behaviors and/or PA among incarcerated youth beyond small program studies. Overall, many adolescents in JCFs report high PA levels and meet PA guidelines. Furthermore, incarcerated adolescents who spend more time in PA report more often feeling joy and energy, building trusting peer relationships, and having better perceived health. These assets are important for youth who face substantial challenges and who may have few opportunities outside of PA to accrue such benefits. Importantly, adolescents in JCFs need more multidisciplinary supports for their mental health, including PA but also clinical services to address concerns of anxiety and depression. One of our recommendations is that researchers, advocates, and Department of Corrections stakeholders work to ensure that JCFs offer sufficient and safe, fun, high quality PA. However, given the profound mental health concerns among incarcerated youth, we also urge them to offer broader health services. Whereas creating health-supporting environments for incarcerated youth is crucial, all youth-serving sectors should work to prevent youth incarceration and reduce the number of youth incarcerated each year.

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**Table 1**

Self-Reported Physical Activity, Psychological, Social, and Perceived Health, and Demographics of Adolescents in Minnesota Juvenile Corrections Facilities (JCFs) (n = 265)

	Female Adolescents n = 77	Male Adolescents n = 188
	m (sd)	m (sd)
Days of 60 min of PA in Previous Week	5.8 (1.8)	5.2 (2.3)
Experience Joy and Energy <sup>a</sup>	2.9 (1.0)	2.9 (1.0)
Develop Trusting Peer Relationships <sup>a</sup>	2.4 (1.0)	2.6 (1.0)
Perceived Health <sup>b</sup>	3.4 (1.0)	4.0 (1.0)
Age	15.1 (1.5)	15.5 (1.7)
	n (%)	n (%)
Days of 60 min of PA in Previous Week		
0 Days	2 (2.7)	17 (9.8)
1 Day	1 (1.4)	3 (1.7)
2 Days	1 (1.4)	4 (2.3)
3 Days	6 (8.1)	10 (5.7)
4 Days	5 (6.8)	20 (11.5)
5 Days	9 (12.2)	16 (9.2)
6 Days	4 (5.4)	16 (9.2)
7 Days	46 (62.2)	88 (50.6)
Meeting PA Guidelines <sup>c</sup>	45 (62.5)	81 (50.6)
Screens Positive for Anxiety Concern <sup>d</sup>	42 (56.8)	56 (32.2)
Screens Positive for Depression Concern <sup>d</sup>	36 (48.6)	44 (25.3)
Race and Ethnicity		
American Indian or Alaska Native Only	16 (20.8)	20 (10.6)
Asian or Asian American Only	1 (1.3)	2 (1.1)
Black, African, or African American Only	8 (10.4)	41 (21.8)
Hispanic or Latina/o Only	2 (2.6)	12 (6.4)
Native Hawaiian or Other Pacific Islander Only	0 (0)	0 (0)
White Only	19 (24.7)	63 (33.5)
Multiple Races or Ethnicities Selected	31 (40.3)	49 (26.1)

Notes.

<sup>a</sup>Each measured with one item. Both began, “When you spend time doing activities outside of the regular school day, how often do you...” and followed with either “do something that gives you joy and energy?” or “develop trusting relationships with peers your age?” Response options for each item ranged from 1 (Rarely or Never) to 5 (Very Often).

<sup>b</sup>Measured with one item, “How would you describe your health in general?” Response options ranged from 1 (Poor) to 5 (Excellent).

<sup>c</sup>Calculated among participants 17 years old or younger, per the *Physical Activity Guidelines for Americans* recommendation of at least 60 minutes of PA every day. 3 female participants and 12 male participants were 18 years old or older.

<sup>d</sup>Depression (2 items, each ranging from 0–3) and anxiety (2 items, each ranging from 0–3) were assessed using the PHQ-4. Positive screens for either mental health concern indicate sum of two items for each was three or more.

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**Table 2**  
 Linear and Logistic Regression Models Testing Physical Activity's Associations with Psychological, Social, and Perceived Health among Adolescents in Minnesota Juvenile Corrections Facilities (n = 265)

Dependent Variables	Model 1s					Model 2s				
	B	95% CI	SE	p-value	R <sup>2</sup>	B	95% CI	SE	p-value	R <sup>2</sup>
Experience Joy and Energy	0.10	0.04–0.16	0.03	.002	.02	0.09	0.03–0.15	0.03	.003	.02
Develop Trusting Peer Relationships	0.09	0.03–0.14	0.03	.005	.03	0.09	0.03–0.15	0.03	.005	.03
Perceived Health	0.04	0.02–0.10	0.03	.164	.06	0.06	0.00–0.12	0.03	.040	.06
	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>Pseudo R<sup>2</sup></b>	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>Pseudo R<sup>2</sup></b>
Anxiety	1.16	1.02–1.32	0.07	.026	.08	1.13	0.99–1.30	0.07	.073	.08
Depression	1.07	0.94–1.22	0.07	.336	.07	1.03	0.90–1.19	0.07	.630	.07

Notes. Model 1s present unadjusted estimates of relationship between physical activity and dependent variables; Model 2s adjust for physical activity, age, and sex; estimates for age and sex not shown.

**Table 3**

Linear and Logistic Regression Models Testing Physical Activity's Associations with Psychological, Social, and Perceived Health among Female Adolescents in Minnesota Juvenile Corrections Facilities (n = 77)

Dependent Variables	Model 1s				Model 2s				R <sup>2</sup>
	B	95% CI	SE	p-value	B	95% CI	SE	p-value	
Experience Joy and Energy	-0.01	-0.16-0.13	0.07	.87	-0.01	-0.16-0.13	0.07	.86	.00
Develop Trusting Peer Relationships	0.02	-0.13-0.18	0.08	.73	0.02	-0.13-0.18	0.08	.74	.00
Perceived Health	-0.01	-0.14-0.14	0.07	.98	-0.01	-0.14-0.14	0.07	.96	.00
	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>Pseudo R<sup>2</sup></b>
Anxiety	1.20	0.91-1.60	0.14	.20	1.20	0.92-1.61	0.14	.18	.03
Depression	0.92	0.69-1.21	0.14	.56	0.93	0.69-1.21	0.14	.58	.01

Notes. Model 1s present unadjusted estimates of relationship between physical activity and dependent variables; Model 2s account for both physical activity and age; estimates for age not shown.

**Table 4**

Linear and Logistic Regression Models Testing Physical Activity's Associations with Psychological, Social, and Perceived Health among Male Adolescents in Minnesota Juvenile Corrections Facilities (n = 188)

Dependent Variables	Model 1s					Model 2s				
	B	95% CI	SE	p-value	R <sup>2</sup>	B	95% CI	SE	p-value	R <sup>2</sup>
Experience Joy and Energy	0.12	0.05–0.19	0.03	.003	.05	0.11	0.05–0.18	0.03	.001	.05
Develop Trusting Peer Relationships	0.11	0.04–0.17	0.03	.001	.04	0.10	0.04–0.17	0.03	.003	.04
Perceived Health	0.07	0.01–0.13	0.03	.024	.03	0.08	0.02–0.14	0.03	.013	.03
	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>Pseudo R<sup>2</sup></b>	<b>OR</b>	<b>95% CI</b>	<b>SE</b>	<b>p-value</b>	<b>Pseudo R<sup>2</sup></b>
Anxiety	1.10	0.95–1.29	0.08	.20	.02	1.09	0.94–1.29	0.08	.25	.02
Depression	1.09	0.92–1.27	0.08	.42	.01	1.06	0.91–1.26	0.08	.49	.01

Notes. Model 1s present unadjusted estimates of relationship between physical activity and dependent variables; Model 2s account for both physical activity and age; estimates for age not shown.