

Preprint

Relation Between Physical Activity and Depression in People with Borderline Personality Disorder

Noémy Maltais^{1,2}, Julianne Noël¹ & Samuel St-Amour^{2,3}

¹Université Laval

²Département des sciences de la santé, Université du Québec à Rimouski

³Centre de recherche de l'Institut universitaire en santé mentale de Montréal

ORCID

NM: 0009-0008-6511-9455

JN: 0009-0008-5187-5276

SS: 0000-0002-6282-7885

Author Contributions

- Contributed to conception and design: NM, JN, SS
- Contributed to acquisition of data: SS
- Contributed to analysis and interpretation of data: NM, JN, SS
- Drafted and/or revised the article: NM, JN, SS
- Approved the submitted version for publication: NM, JN, SS

Conflict of Interest

The authors have no conflict of interest to disclose.

Acknowledgments

We would like to thank all participants for their valuable contribution to this study, as well as to everyone who got involved in the promotion of the survey and the recruitment process.

Corresponding author: Samuel St-Amour: Samuel_st-amour@uqar.ca

Abstract

Borderline personality disorder (BPD), marked by mood instability, impulsivity, and relationship difficulties, often co-occurs with depression. Depression involves persistent sadness, emptiness, irritability, and cognitive or somatic impairments that hinder daily life. Physical activity (PA) is recognized as a first-line monotherapy for depression, and recent studies suggest benefits for BPD symptoms. Yet, no research has examined PA's impact on depressive symptoms in BPD. This study explored the relationship between PA and depression among individuals with BPD using online questionnaires across eight French- and English-speaking countries. Data included sociodemographic factors, health status, and PA levels (type, intensity, duration). Logistic regression showed leisure-related ($p = .013$) and transport-related PA ($p = .035$) reduced depression likelihood. Spearman correlations confirmed associations between leisure-time PA ($\rho = -.291, p < .001$) and total PA ($\rho = -.179, p = .026$) with depression. PA appears promising as preventive and complementary intervention for BPD-related depression.

Keywords: Borderline personality disorder, depression, physical activity

Relation Between Physical Activity and Depression in People with Borderline Personality Disorder

Borderline personality disorder (BPD) is a complex and multifaceted mental illness characterized by pervasive instability in mood and emotion, behavior, self-image, interpersonal relationships and affective instability. Individuals with BPD often experience sudden and intense shifts in how they perceive themselves and others, oscillating between idealization and devaluation (American Psychiatric Association, 2013). BPD typically manifests in early adulthood and affects approximately 5.9% of the general population over their lifetime (Gunderson et al., 2018; American Psychiatric Association, 2013). Among these people, approximately 75% of those diagnosed with the disorder are women (American Psychiatric Association, 2013). BPD is marked by high rates of psychiatric hospitalization, self-harm, and suicide attempts. The disorder often leads to serious social and occupational impairments. (Yen et al., 2021; Gunderson et al., 2018; Shah & Zanarini, 2018; Rebok et al., 2015)

The complexity of BPD is further compounded by its frequent comorbidity with other psychiatric conditions (Leichsenring et al., 2023; Gunderson et al., 2018; Beatson & Rao, 2013). Mood disorders, and more specifically depressive disorders, are among the most prevalent disorders comorbid with BPD with 96% and 83% of individuals with BPD also diagnosed with them respectively (Gunderson et al., 2018; Köhling et al., 2015; Leichsenring et al., 2023; Lieb et al., s. d.; Shah & Zanarini, 2018). Moreover, BPD itself has been identified as a strong predictor of the persistence of major depressive disorder (Skodol et al., 2011).

Depression is characterized by persistent feelings of sadness, emptiness, or irritability, along with significant somatic and cognitive changes substantially (American Psychiatric Association, 2013). A recent literature review conceptualizes depression as resulting from intricate

interactions between social, psychological, and biological factors (Remes et al., 2021). BPD has also been described in similar terms (Beatson & Rao, 2013; Gunderson et al., 2018), and both conditions share several overlapping symptoms, including an unstable and negative self-perception, suicidal behavior and feelings of worthlessness (Rao & Broadbear, 2019). Moreover, in a systematic review by Köhling and colleagues (2015), people with comorbid depression and BPD presented higher levels of symptoms compared to depressed people, such as feelings of despair, emptiness, or self-hatred. All these common factors make differential diagnosis complex (Rao & Broadbear, 2019; Gunderson et al., 2018)

Among the evidence-based therapeutic approaches for treating depression, physical activity (PA) is now presented as a first-line monotherapy for depressive disorders (Lam & al., 2024; Ravindran & al., 2016). The World Health Organization (2020) defines PA as “any bodily movement produced by skeletal muscles, involving energy expenditure” and recommends doing 150-300 minutes of moderate intensity PA or 75-150 minutes of vigorous intensity PA weekly combining leisure, transportation, work and household-related PA. Many meta-analyses and systematic reviews showed that following these recommendations reduces the incidence of depression, helps treat depression, and prevent relapse once in recovery (Noetel et al., 2024; Pearce et al., 2022; Schuch et al., 2018). Moreover, recent studies indicated that PA may also reduce BPD symptoms (St-Amour, Cailhol, Ruocco, et al., 2022a; St-Amour et al., 2024; Weiss et al., 2025). A longitudinal study also associated PA to recovery from BPD in patients (Glass et al., 2024). However, the effect of PA on BPD remains understudied (Petersen & al., 2025; St-Amour & al., 2023).

The aim of this study is to explore the relation between PA and depressive disorder in people with a diagnosis of BPD. It is expected that regular PA practice will be associated with

fewer depressive disorders. Also, the interactions with variables such as birth-assigned sex and socioeconomic level could modulate these effects.

Methods

This study analyzes data from a cross-sectional study published previously (St-Amour al., 2022). The original study was carried out using an online survey designed on the LimeSurvey platform and hosted on the Université du Québec à Montréal's servers. The survey was disseminated online in Canada, England, France, the United States and Switzerland through various online channels, including YouTube videos, Facebook groups, forums, and chat groups dedicated to adults with BPD, with explicit consent from the respective administrators. Additionally, collaboration with psychiatrists facilitated further distribution among their patients, colleagues, and professional networks associated with BPD patient care.

Participants were required to meet the following criteria: 1- being at least 18 years old, 2- residing in one of the specified countries (Canada, England, France, the United States or Switzerland), and 3- have received a BPD diagnosis from a healthcare professional. Prior to survey completion, all participants were required to read and agree to the online information and consent form, with the option to contact the research team for clarification.

Questionnaires

Sociodemographic Characteristics

All questionnaires used in this survey have been previously validated in English and in French. All items and questionnaires in both languages are available in open access (<https://osf.io/5u6am/>). Additionally, socio-demographic data encompassing country of residence, birth-assigned sex, age, educational attainment, marital status and household income.

Clinical Characteristics

Participants then filled out the Borderline Symptoms List-Short Form (BSL-23) validated to measure the severity of symptoms associated with BPD from a categorical approach to personality (Bohus & al., 2009). It contains 23 items answered on a 5-point Likert scale ranging from 0 to 4. Then, participants complete the Beck Depression Inventory-Short Form (BDI-SF). This questionnaire contains 13 items that evaluate the severity of depressive symptoms, with responses scored on a scale from 0 to 3 (Dadfar & Kalibatseva, 2016) validated to measure and assess the main components of depressive disorder (Furlanetto & al., 2005). A score between 0-4 indicates no clinically significant depression, 5-7 indicates mild depression disorder, between 8-15 indicates moderate depression disorder and above 15 indicates severe depression (Soler et al., 2021). For this study, to ensure the dichotomy of our data, individuals with a score higher than or equal to 8 were classified as “suffering from depressive disorder.”

Health Behaviors and Physical Activities

The Global Physical Activity Questionnaire (GPAQ) was used to assess physical activity levels, focusing on the domains of occupational, transport-related and leisure-related physical activity (Keating & al., 2019). It comprises 6 items detailing different domains and intensity of physical activity and the time spent practicing them over the precedent week. Answers are given in numbers of days, hours and minutes.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics software, version 29.0.2.0. Descriptive statistics were used to summarize sociodemographic and clinical characteristics of the sample, with percentages reported for each category within the variables, including country of residence, sex assigned at birth, age, education, marital status, income, and health status. Descriptive statistics were also generated to describe the sample in terms of physical activity levels

and depressive disorder, for which the mean and standard deviation were reported. Non-parametric tests were used for all analyses due to violations of normality assumptions. Thus, binary logistic regression was performed to assess the association between depression and physical activity. In addition, Spearman's rank-order correlations were conducted to explore the association between sociodemographic variables and physical activity, as well as between depression and sociodemographic variables.

Outliers in PA levels and sociodemographic characteristics were identified and removed based on implausible or extreme values, such as reported levels of PA exceeding 3,500 minutes per week and/or sociodemographic responses incompatible with the dichotomous format used for analyses. All variables were visually inspected and screened for implausible values. Pre-specified cut-offs for PA levels and sociodemographic answers not fitting the dichotomous format were reviewed individually. If the value could not be verified or corrected, the participant was excluded from the current analyses.

Results

192 participants who reported having a BPD diagnosis completed the online survey. A total of 35 outliers were excluded based on predefined criteria. After these exclusions, data from 156 participants were retained for final analyses. Descriptive statistics for the final sample are presented in Table 1.

Table 1. Descriptive data of subjects

Factors	n (%)
Country of residence	
Canada	81 (51.9)
France	60 (38.5)

	United States	8 (5.1)
	England	6 (3.8)
	Switzerland	1 (.6)
Birth-assigned sex		
	Female	133 (85.3)
	Male	23 (14.7)
Age		
	> 30	92 (59.0)
Education		
	≥ University education	61 (39.1)
Marital status		
	Single	76 (48.7)
	Civil Union	41 (26.3)
	Married	18 (11.5)
	Divorced	17 (10.9)
	Widowed	2 (1.3)
	Other	2 (1.3)
Income		
	< 20 000	62 (39.7)
	20 000 – 39 999	32 (20.5)
	40 000 – 59 999	21 (13.5)
	60 000 – 79 999	23 (14.7)
	80 000 – 100 000	10 (6.4)

	> 100 000	8 (5.1)
Health status		
	Have been hospitalized	90 (57.7)
	Attempted suicide	99 (63.5)

Note. *n* Total sample size = 156

Levels of Physical Activity

According to the WHO guidelines (completing at least 150 minutes of physical activity per week; WHO, Regional Office for Europe & United Nations Economic Commission for Europe, 2022), 105 participants (67.31%) met the criteria for being active. Across all 156 participants, the average level of overall PA was 623.70 minutes per week (SD = 749.41). When broken down by domain, participants reported an average of 322.31 minutes per week (SD = 669.90) of occupational physical activity, 134.90 minutes per week (SD = 257.03) of leisure-related physical activity, and 166.48 minutes per week (SD = 277.85) of transport-related physical activity.

Factors Associated with Physical Activity

Spearman bivariate correlation analyses were conducted to explore the association between physical activity levels and various sociodemographic variables. Both physical activity levels and sociodemographic factors were treated as dichotomous variables and physical activity was categorized based on weekly duration and results are presented in Table 2. Among the variables assessed (sex assigned at birth, age, education level, marital status, income, hospitalization number, and suicide attempts), only sex showed a statistically significant correlation with physical activity levels, as indicated by Spearman's correlation coefficient of 0.229 ($p = 0.004$).

Table 2. Correlation Between Sociodemographic and Clinical Factors and PA levels

Factors	Spearman's ρ (p-value)
---------	-----------------------------

Birth-assigned sex	-.229 (.004) **
Age	-.032 (.656)
Education	.006 (.942)
Marital status	-.072 (.371)
Income	-.073 (.364)
Have been hospitalized	-.022 (.788)
Attempted suicide	-.125 (.121)

Note. **< 0,01 (bilateral), ρ = Spearman's rho.

Table 3 presents the association between sociodemographic data and depressive disorder. Spearman correlations were also used to assess these associations, with both variables treated as dichotomous. Depressive disorders were categorized based on participants' scores on the BDI-SF, with those scoring 8 or higher classified as "suffering from depressive disorder."

Table 3. Correlations Between Sociodemographic and Clinical Factors and Depressive disorder

Factors	Spearman's ρ (p-value)
Birth-assigned sex	.072 (.369)
Age	-.076 (.344)
Education	.024 (.763)
Marital status	-.058 (.474)
Income	-.102 (.204)
Have been hospitalized	.056 (.490)
Attempted suicide	-.035 (.646)

Note. No correlations reached statistical significance. ρ = Spearman's rho.

Spearman correlations were performed between depressive disorder and different domains of PA. The analysis results are presented in Table 4.

Table 4. Correlations Between Physical Activity and Depressive disorder

PA domain	Spearman's ρ (p-value)
Occupational PA	-.049 (.544)
Leisure-related PA	-.291**(<.001)
Transport-related PA	-.109 (.177)
Total PA	-.179* (.026)

Note. * < 0.05 (bilateral), ** < 0.01 (bilateral), ρ = Spearman's rho.

Binomial logistic regression analyses were performed to examine whether different domains of PA predicted the presence of depressive disorder. Depression was coded dichotomously, with participants scoring 8 or higher on the BDI-SF categorized as "suffering from depressive disorder."

The initial model showed that overall, PA significantly predicted depressive disorder ($B = 1.435$, $SE = 0.203$, $Wald = 49.902$, $p < .001$, $\text{Exp}(B) = 4.200$), indicating that physically inactive participants were over four times more likely to exhibit depressive disorder than active ones.

In the second step, the model included PA subdomains: occupational, leisure-related, and transport-related PA, along with total PA. The full model was statistically significant, $\chi^2(4) = 11.954$, $p = .008$, indicating that the domains of PA in the model helped predict whether participants had depressive disorder. It explained approximately 11.8% of the variance in depressive disorder (Nagelkerke $R^2 = .118$) and correctly classified 81.4% of cases.

Table 5 shows that leisure-related and transport-related PA were both significantly and negatively associated with depressive disorder, suggesting that greater involvement in these types of PA is associated with lower odds of reporting symptoms. In contrast, occupational PA was not a significant predictor of depressive disorder.

Table 5. Binomial Logistic Regression Models Predicting Depression from Physical Activity Types

PA type	B	SE	Wald	df	p-value (sig.)	Exp(B)	95% CI for Exp(B)
Occupatio nal PA	.000	.000	.118	1	.731	1.000	-.002
Leisure- related PA	-.002	.001	6.151	1	.013	.998	-.003
Transport- related PA	-.002	.001	4.462	1	.035	.998	-.003

Note. B: Unstandardized coefficient (log odds), SE: Standard error, Wald: Wald chi-square test (for significance of the predictor), df: Degrees of freedom (usually 1), p-value (Sig.): Indicates whether the predictor is statistically significant, Exp(B): The exponentiated B = odds ratio (OR), 95% CI for Exp(B): Confidence interval for the odds ratio

Discussion

This study is the first to specifically investigate the association between PA and depressive disorder in individuals diagnosed with BPD. Findings revealed significant associations between both leisure-time PA and total PA with depressive disorder. In contrast, PA related to transportation and occupation did not demonstrate a consistent relationship with depressive disorder. Logistic regression analysis indicated that individuals diagnosed with BPD engaging in leisure-time PA had a lower likelihood of experiencing depressive disorder. A similar, albeit markedly weaker, association was observed for transportation-related PA, whereas no significant relationship emerged for occupational PA.

Physical Activity and Depressive Disorder

The results of logistic regression analysis indicate that physically inactive individuals are up to four times more likely to develop depressive disorder than those who remain active. Thus,

physical activity appears to influence the presence of these symptoms. Several studies converge on this observation, reporting that physical activity has a beneficial effect on depressive disorder (Bélair & al., 2018; Harvey & al., 2010; Petersen & al., 2025; Schuch & al., 2018) and plays a preventive role in the onset of future depressive episodes (Pearce & al., 2022; Gianfredi & al., 2020). The bidirectional aspect must also be considered, as depressive disorder could lead to a decrease in PA levels, particularly due to fatigue, social isolation, or lack of motivation (Harvey & al., 2010). Therefore, an increase in depressive disorder may also be associated with and could explain a decrease of PA or inactivity in our sample. Regarding the subdomains of PA (work-related, leisure-related, and transport-related), our regression reveals that, although the effect is relatively small, both leisure-related and transport-related PA are associated with a reduction in the likelihood of experiencing various depressive disorders. According to the article by Harvey & al. (2010), leisure-related PA, because it is voluntary, is particularly beneficial for psychological well-being, as it boosts self-confidence and thus helps to reduce depressive disorder.

Physical Activity, Depressive Disorder, Sociodemographic and Clinical Factors

No significant correlation was observed between sociodemographic and clinical factors and depressive disorder in the present study, which differs from several previous studies. Indeed, the literature generally reports that certain sociodemographic factors play an important role in the prevalence of depression (Islam & Adnan, 2017; St-Amour al., 2022). Thus, age and marital status are correlated with depression, as are educational level and family income (Islam & Adnan, 2017). The results obtained in the present study could be explained by the limited sample size and/or by characteristics specific to people with BPD and comorbid depression compared to depression alone. Moreover, as depressive disorder can fluctuate over short periods of time (Thompson et al., 2011) while sociodemographic data remain relatively stable over time, this difference can lead to

a lack of concordance between these two types of measures, which can limit the accuracy of interpretation. In this study, depressive disorders were measured at a single time point, which further constrains the ability to capture the influence of distal factors. Thus, the immediate influences on depression (proximal factors like physical inactivity, stress, etc.) could be much stronger predictors than sociodemographic variables (Marques et al., 2020). This could reduce the importance of factors such as age, marital status, and education on depression because their effect is partially mediated by more direct variables (Patterson et al., 2022). Furthermore, no significant association was observed between physical activity and sociodemographic characteristics, except for sex assigned at birth. These results also appear to differ from those obtained in the study by St-Amour & al. (2022), on which this secondary study was based.

Limitations

This study has several limitations that must be considered when interpreting its findings. First, although certain barriers may have prevented participants from engaging in PA (e.g., injuries, personal issues), these barriers were not identified or measured, which limits our understanding of potential confounding factors. Second, both depressive disorder and the diagnosis of BPD were self-reported, increasing the risks of diagnostic inaccuracies and making it difficult to ensure that the sample consisted exclusively of adults with BPD. Previous literature has highlighted that individuals with BPD often experience marked difficulties in self-observation, which may further compromise the reliability of self-reported data (Gunderson & al., 2018). Moreover, the relatively small sample size limits the generalization of the results. Additionally, as the study was conducted online, accessibility issues may have excluded certain individuals or populations, introducing potential selection bias. Furthermore, the sample was drawn from Western countries, which restricts the applicability of the results to other cultural contexts. Ultimately, further research

employing longitudinal and experimental designs is needed to explore these associations and explore potential moderating and mediating factors.

Conclusion

Given that nearly 83% of individuals with BPD also experience depressive episodes, identifying protective or therapeutic factors is particularly relevant. In parallel, PA has been recognized as a first-line monotherapy for depression (Ravindran et al., 2016). However, its potential benefits in the context of BPD remain understudied. This study is among the first to examine the relationship between PA and depressive disorder in diagnosed BPD patients. Results indicate that engaging in regular PA, particularly leisure and transport-related PA, is associated with a lower likelihood of experiencing depressive disorder. In contrast, no significant association was found between occupational PA and depressive disorder, which highlights the importance of distinguishing between activity types when considering mental health benefits. Overall, these findings suggest that PA represents a promising therapeutic option for individuals with BPD, both as a preventive factor against depressive disorder and as an accessible complementary intervention. Future research should use longitudinal and experimental methodologies and explore potential mediating and moderating factors, including barriers to activity, to better understand the mechanisms underlying these associations. Such research could ultimately enable personalized PA programs to be made for individuals living with BPD.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders DSM-5* (5e éd). American Psychiatric Publishing.
- Beatson, J. A., & Rao, S. (2013). Depression and borderline personality disorder. *Medical Journal of Australia*, 199(S6), S24-S27. <https://doi.org/10.5694/mja12.10474>

- Dadfar, M., & Kalibatseva, Z. (2016). Psychometric Properties of the Persian Version of the Short Beck Depression Inventory with Iranian Psychiatric Outpatients. *Scientifica*, 2016, 1-6. <https://doi.org/10.1155/2016/8196463>
- Glass, I. V., Frankenburg, F. R., & Zanarini, M. C. (2024). Longitudinal description and prediction of physical inactivity among patients with borderline personality disorder and personality-disordered comparison subjects. *Borderline Personality Disorder and Emotion Dysregulation*, 11(1), 11. <https://doi.org/10.1186/s40479-024-00253-4>
- Gunderson, J. G., Herpertz, S. C., Skodol, A. E., Torgersen, S., & Zanarini, M. C. (2018). Borderline personality disorder. *Nature Reviews Disease Primers*, 4(1), 18029. <https://doi.org/10.1038/nrdp.2018.29>
- Islam, Md. R., & Adnan, R. (2017). Socio-Demographic Factors and Their Correlation with the Severity of Major Depressive Disorder : A Population Based Study. *World Journal of Neuroscience*, 07(02), 193-202. <https://doi.org/10.4236/wjns.2017.72014>
- Köhling, J., Ehrenthal, J. C., Levy, K. N., Schauenburg, H., & Dinger, U. (2015). Quality and severity of depression in borderline personality disorder : A systematic review and meta-analysis. *Clinical Psychology Review*, 37, 13-25. <https://doi.org/10.1016/j.cpr.2015.02.002>
- Leichsenring, F., Heim, N., Leweke, F., Spitzer, C., Steinert, C., & Kernberg, O. F. (2023). Borderline Personality Disorder : A Review. *JAMA*, 329(8), 670-679. <https://doi.org/10.1001/jama.2023.0589>
- Lieb, K., Zanarini, M. C., Schmahl, C., Linehan, M. M., & Bohus, M. (s. d.). *Borderline personality disorder*.

Marques, A., Bordado, J., Peralta, M., Gouveia, E. R., Tesler, R., Demetriou, Y., & Gomez

Baya, D. (2020). Cross-sectional and prospective relationship between physical activity and depression symptoms. *Scientific Reports*, 10(1), 16114.

<https://doi.org/10.1038/s41598-020-72987-4>

Noetel, M., Sanders, T., Gallardo-Gómez, D., Taylor, P., del Pozo Cruz, B., van den Hoek, D.,

Smith, J. J., Mahoney, J., Spathis, J., Moresi, M., Pagano, R., Pagano, L., Vasconcellos, R., Arnott, H., Varley, B., Parker, P., Biddle, S., & Lonsdale, C. (2024). Effect of exercise for depression : Systematic review and network meta-analysis of randomised controlled trials. *The BMJ*, 384, e075847. <https://doi.org/10.1136/bmj-2023-075847>

Patterson, S. L., Trupin, L., Yazdany, J., Dall’Era, M., Lanata, C., Dequattro, K., Hartogensis,

W., & Katz, P. (2022). Physical Inactivity and Incident Depression in a Multiracial, Multiethnic Systemic Lupus Erythematosus Cohort. *Arthritis care & research*, 74(7), 1098-1104. <https://doi.org/10.1002/acr.24555>

Pearce, M., Garcia, L., Abbas, A., Strain, T., Schuch, F. B., Golubic, R., Kelly, P., Khan, S.,

Utukuri, M., Laird, Y., Mok, A., Smith, A., Tainio, M., Brage, S., & Woodcock, J. (2022). Association Between Physical Activity and Risk of Depression. *JAMA Psychiatry*, 79(6), 550-559. <https://doi.org/10.1001/jamapsychiatry.2022.0609>

Petersen, J., Palic, S., Nyboe, L., Schuster, M., Videbech, P., & Midtgaard, J. (2025). Physical activity in the management of borderline personality disorder : A scoping review.

Psychiatry Research, 350, 116535. <https://doi.org/10.1016/j.psychres.2025.116535>

Rao, S., & Broadbear, J. (2019). Borderline personality disorder and depressive disorder.

Australasian Psychiatry, 27(6), 573-577. <https://doi.org/10.1177/1039856219878643>

- Ravindran, A. V., Balneaves, L. G., Faulkner, G., Ortiz, A., McIntosh, D., Morehouse, R. L., Ravindran, L., Yatham, L. N., Kennedy, S. H., Lam, R. W., MacQueen, G. M., Milev, R. V., & Parikh, S. V. (2016). Canadian Network for Mood and Anxiety Treatments (CANMAT) 2016 Clinical Guidelines for the Management of Adults with Major Depressive Disorder : Section 5. Complementary and Alternative Medicine Treatments. *The Canadian Journal of Psychiatry*, 61(9), 576-587.
<https://doi.org/10.1177/0706743716660290>
- Rebok, F., Teti, G. L., Fantini, A. P., Cárdenas-Delgado, C., Rojas, S. M., Derito, M. N. C., & Daray, F. M. (2015). Types of Borderline Personality Disorder (BPD) in Patients Admitted for Suicide-Related Behavior. *Psychiatric Quarterly*, 86(1), 49-60.
<https://doi.org/10.1007/s11126-014-9317-3>
- Remes, O., Mendes, J. F., & Templeton, P. (2021). Biological, Psychological, and Social Determinants of Depression : A Review of Recent Literature. *Brain Sciences*, 11(12), 1633. <https://doi.org/10.3390/brainsci11121633>
- Schuch, F. B., Vancampfort, D., Firth, J., Rosenbaum, S., Ward, P. B., Silva, E. S., Hallgren, M., Ponce De Leon, A., Dunn, A. L., Deslandes, A. C., Fleck, M. P., Carvalho, A. F., & Stubbs, B. (2018). Physical Activity and Incident Depression : A Meta-Analysis of Prospective Cohort Studies. *American Journal of Psychiatry*, 175(7), 631-648.
<https://doi.org/10.1176/appi.ajp.2018.17111194>
- Shah, R., & Zanarini, M. C. (2018). Comorbidity of Borderline Personality Disorder : Current Status and Future Directions. *Psychiatric Clinics of North America*, 41(4), 583-593.
<https://doi.org/10.1016/j.psc.2018.07.009>

- Skodol, A. E., Grilo, C. M., Keyes, K. M., Geier, T., Grant, B. F., & Hasin, D. S. (2011). Relationship of Personality Disorders to the Course of Major Depressive Disorder in a Nationally Representative Sample. *American Journal of Psychiatry*, 168(3), 257-264. <https://doi.org/10.1176/appi.ajp.2010.10050695>
- Soler, J., Guillaumot, A., Schwitzer, T., Chenuel, B., Chaouat, A., & Chabot, F. (2021). Impact spécifique du réentraînement à l'exercice sur les symptômes de dépression dans la broncho-pneumopathie chronique obstructive : Expérience du Réseau insuffisance respiratoire de Lorraine. *Revue des Maladies Respiratoires*, 38(6), 598-606.
- St-Amour, S., Bérubé, F., Cailhol, L., & Le Corff, C. (2023). Are physical activity and nutrition linked to personality disorders? Health habits and personality disorders: A scoping review. *Personality and Mental Health*, 17(2), 147-156. <https://doi.org/10.1002/pmh.1568>
- St-Amour, S., Brunet, E., Cailhol, L., Baretta, D., Chevance, G., & Bernard, P. (2024). Effects of supervised physical exercise on emotions among adult women with a diagnostic of borderline personality disorder : A series of mixed method single-case experimental trials combined with ecological momentary assessment. *Asian Journal of Sport and Exercise Psychology*, 4(2), 46-59. <https://doi.org/10.1016/j.ajsep.2024.05.002>
- St-Amour, S., Cailhol, L., Kingsbury, C., Ducasse, D., Landry, G., & Bernard, P. (2022). Activité physique, sommeil et consommation de substances chez les adultes déclarant un trouble de personnalité limite en France et au Canada : Une étude en ligne. *Santé mentale au Québec*, 47(2), 41-67.

- St-Amour, S., Cailhol, L., Ruocco, A. C., & Bernard, P. (2022a). Acute Effect of Physical Exercise on Negative Affect in Borderline Personality Disorder : A Pilot Study. *Clinical Psychology in Europe*, 4(2), Article 2. <https://doi.org/10.32872/cpe.7495>
- St-Amour, S., Cailhol, L., Ruocco, A. C., & Bernard, P. (2022b). Acute Effect of Physical Exercise on Negative Affect in Borderline Personality Disorder : A Pilot Study. *Clinical Psychology in Europe*, 4(2), Article 2. <https://doi.org/10.32872/cpe.7495>
- Thompson, R. J., Berenbaum, H., & Bredemeier, K. (2011). Cross-Sectional and Longitudinal Relations Between Affective Instability and Depression. *Journal of affective disorders*, 130(1-2), 53-59. <https://doi.org/10.1016/j.jad.2010.09.021>
- Weiss, E. R., Hart-Derrick, V. R., Ramsay-Patel, T., Barnes, S. E., Anderson, H., Gatti, C., & Davis, M. T. (2025). Acceptability and feasibility of a Taekwondo mindful movement intervention in Dialectical Behavior Therapy. *Journal of Behavioral and Cognitive Therapy*, 35(2), 100527. <https://doi.org/10.1016/j.jbct.2025.100527>
- Yen, S., Peters, J. R., Nishar, S., Grilo, C. M., Sanislow, C. A., Shea, M. T., Zanarini, M. C., McGlashan, T. H., Morey, L. C., & Skodol, A. E. (2021). Association of Borderline Personality Disorder Criteria With Suicide Attempts : Findings From the Collaborative Longitudinal Study of Personality Disorders Over 10 Years of Follow-up. *JAMA Psychiatry*, 78(2), 187-194. <https://doi.org/10.1001/jamapsychiatry.2020.3598>