The Association Between Biopsychosocial Treatment Intensity and Outcomes in Workers Severely Disabled by Low Back Pain

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Background & Purpose

- Workers severely disabled by low back pain often have complex functional and biopsychosocial barriers to recovery.[1]
- One occupational medicine program uses an intensive, transdisciplinary, biopsychosocial therapeutic community model to help injured workers overcome disability, kinesiophobia, and psychological symptoms.
- This analysis evaluated the association between the number of hours a worker participated in the program and a series of outcomes related to disability, kinesiophobia, and psychological symptoms.

Materials & Methods

Sample

- Retrospective analysis of concluded treatment episodes initiated during 2023-2025 at the occupational medicine program described above
- Inclusion criteria: baseline Oswestry score >40, >0 program hours, no prior episode at the facility, repeated Oswestry/Tampa/BBHI 2 observations, and complete data

Independent Variables:

- Program hours attended ($\log_2$ transformed)
- Episode duration in days, from initiation to completion ($\log_2$ transformed)

Dependent Variables:

- Oswestry Disability Index[2]: Oswestry improvement (baseline-final); ≥10-point Oswestry improvement; severe disability resolved (final Oswestry <41)
- Tampa Scale for Kinesiophobia[3]: Tampa improvement (baseline-final); ≥10-point Tampa improvement; severe kinesiophobia not present at end of treatment (final Tampa <43)
- Brief Battery for Health Improvement 2 (BBHI 2)[4]: BBHI 2 domain issue resolved (final BBHI 2 domain score <84)

Control Variables: baseline Oswestry; baseline Tampa; baseline BBHI 2 scores; sex; age; treatment location

Analysis:

- Adjusted linear regression was used to assess continuous outcomes (improvement in points)
- Adjusted logistic regression was used to assess binary outcomes (e.g., ≥10-point improvement, resolution)
- Log-log linear regression was used to assess the relationship between program hours and episode duration

Review: As the analysis met the requirements of 45 CFR 46.104(d)(4), it was deemed exempt from Institutional Review Board (IRB) review under the Institutes of Health (IOH) Policy on Exempt Secondary Research. Individual informed consent was not required. No investigational drug or device was involved.

Results

- The analysis included 199 patients after sample selection criteria were applied. Mean Oswestry improvement was 12.39 points; 59.8% (119/199) improved by ≥10 points, and 36.7% (73/199) resolved severe disability. Mean Tampa improvement was 6.88 points; 38.2% (76/199) improved by ≥10 points, and 40.2% (80/199) had a Tampa score <43 at conclusion.
- Doubling biopsychosocial treatment intensity was associated with 2.89 additional points of Oswestry improvement (p<0.001, 95% CI: 1.77 — 4.02), higher adjusted odds of ≥10-point Oswestry improvement (OR: 1.60, 95% CI: 1.25 — 2.06) and of resolving severe disability (OR: 1.40, 95% CI: 1.10 — 1.79). (See Table 1)
- Doubling biopsychosocial treatment intensity was associated with 1.49 additional points of Tampa improvement (p<0.001, 95% CI: 0.89 — 2.09), higher adjusted odds of ≥10-point Tampa improvement (OR: 1.76, 95% CI: 1.27 — 2.45) and of completing treatment without severe kinesiophobia (Tampa score <43; OR: 1.73, 95% CI: 1.26 — 2.38). (See Table 2)
- Increased program hours were significantly associated with subclinical (<84) measures of all the BBHI 2 outcomes for the models that were estimable. The model for the BBHI 2 defensiveness outcome was not estimable. (See Table 3)
- When episode duration was included in the model, doubling program hours was associated with 4.43 additional points of Oswestry improvement (95% CI: 2.70 — 6.16) and doubling episode duration at fixed program hours was associated with 2.20 fewer points of Oswestry improvement (95% CI: −4.09 — −0.31). (See Table 4)
- Doubling program hours was associated with a 62% longer episode (95% CI: 53% — 72%), rather than an episode that was of double the duration.

Conclusions

- More hours of participation in biopsychosocial treatment were independently associated with improvement in disability, kinesiophobia, and multiple BBHI 2 symptom domains among workers severely disabled by low back pain.
- Improvement reflected both the amount and rate of treatment.
- In the biopsychosocial therapeutic community model program examined, more intensive transdisciplinary rehabilitation of injured workers with complex barriers to recovery was associated with multiple forms of clinically meaningful improvement.

References

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3. Neblett R, Hartzell MM, Mayer TG, Bradford EM, Gatchel RJ. Establishing clinically meaningful severity levels for the Tampa Scale for Kinesiophobia (TSK-13). Eur J Pain. 2016;20(5):701-710.
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Clinical Implication

Treatment dose and concentration both matter.

Patients had
40% higher adjusted odds
of **resolving severe disability** for each doubling of program hours

Patients had
73% higher adjusted odds
of **completing treatment without severe kinesiophobia** for each doubling of program hours

At the same treatment dose, patients had
2.20 fewer points of Oswestry improvement
for each doubling of episode duration

Workers' Compensation Implication

The utilization issue is not only how much treatment is delivered, but also whether it is delivered with sufficient intensity over time.

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Table 1. Adjusted associations between program hours and disability outcomes

	Oswestry improvement (continuous)		≥10-point Oswestry improvement (binary)		Resolution of severe disability (binary)	
Variable	β (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*
Program hours ($\log_2$)	2.89 (1.77 — 4.02)	<0.001	1.602 (1.247 — 2.058)	<0.001	1.402 (1.097 — 1.792)	0.007
Baseline Oswestry score	0.65 (0.46 — 0.84)	<0.001	1.080 (1.041 — 1.121)	<0.001	0.959 (0.926 — 0.993)	0.020
Baseline Tampa score	−0.08 (−0.39 — 0.22)	0.588	0.983 (0.933 — 1.034)	0.503	0.974 (0.924 — 1.027)	0.325
Baseline BBHI 2 anxiety	0.16 (0.03 — 0.28)	0.014	1.017 (0.995 — 1.039)	0.137	1.031 (1.006 — 1.057)	0.016
Baseline BBHI 2 defensiveness	0.09 (−0.07 — 0.25)	0.253	1.015 (0.988 — 1.043)	0.267	1.007 (0.981 — 1.034)	0.596
Baseline BBHI 2 depression	−0.08 (−0.22 — 0.07)	0.297	1.003 (0.978 — 1.029)	0.829	0.981 (0.958 — 1.006)	0.133
Baseline BBHI 2 functional complaints	−0.05 (−0.24 — 0.15)	0.645	1.006 (0.973 — 1.039)	0.744	1.005 (0.972 — 1.039)	0.766
Baseline BBHI 2 pain complaints	−0.12 (−0.22 — −0.02)	0.022	0.975 (0.957 — 0.994)	0.010	0.980 (0.963 — 0.998)	0.025
Baseline BBHI 2 somatic complaints	−0.09 (−0.23 — 0.05)	0.222	0.987 (0.962 — 1.013)	0.336	0.987 (0.962 — 1.012)	0.309
Male sex	−0.10 (−4.01 — 3.81)	0.960	1.076 (0.545 — 2.124)	0.834	0.728 (0.364 — 1.455)	0.369
Age	−0.04 (−0.20 — 0.12)	0.644	1.015 (0.987 — 1.044)	0.302	0.996 (0.970 — 1.024)	0.795
San Diego location (vs. other)	3.27 (−2.75 — 9.29)	0.285	1.345 (0.454 — 3.985)	0.596	1.837 (0.612 — 5.513)	0.277
Riverside location (vs. other)	0.81 (−5.57 — 7.20)	0.802	0.889 (0.284 — 2.783)	0.840	1.670 (0.524 — 5.325)	0.386

Table 2. Adjusted associations between program hours and kinesiophobia outcomes

	Tampa improvement (continuous)		≥10-point Tampa improvement (binary)		Absence of severe kinesiophobia (binary)	
Variable	β (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*
Program hours ($\log_2$)	1.49 (0.89 — 2.09)	<0.001	1.762 (1.266 — 2.451)	<0.001	1.733 (1.264 — 2.377)	0.001
Baseline Oswestry score	−0.06 (−0.16 — 0.04)	0.236	0.976 (0.940 — 1.014)	0.208	0.974 (0.941 — 1.009)	0.146
Baseline Tampa score	0.77 (0.61 — 0.93)	<0.001	1.298 (1.193 — 1.411)	<0.001	0.934 (0.885 — 0.986)	0.013
Baseline BBHI 2 anxiety	−0.06 (−0.13 — 0.01)	0.087	0.995 (0.969 — 1.022)	0.721	0.983 (0.962 — 1.004)	0.121
Baseline BBHI 2 defensiveness	0.08 (−0.01 — 0.16)	0.066	1.020 (0.986 — 1.056)	0.256	1.017 (0.990 — 1.045)	0.209
Baseline BBHI 2 depression	−0.02 (−0.10 — 0.06)	0.590	0.969 (0.941 — 0.997)	0.028	1.008 (0.983 — 1.032)	0.542
Baseline BBHI 2 functional complaints	0.08 (−0.03 — 0.18)	0.152	1.025 (0.984 — 1.067)	0.239	0.997 (0.964 — 1.031)	0.856
Baseline BBHI 2 pain complaints	−0.05 (−0.10 — 0.01)	0.082	0.991 (0.970 — 1.012)	0.404	0.994 (0.976 — 1.012)	0.503
Baseline BBHI 2 somatic complaints	0.00 (−0.07 — 0.08)	0.951	0.997 (0.970 — 1.026)	0.860	1.001 (0.977 — 1.026)	0.910
Male sex	−2.13 (−4.22 — −0.04)	0.046	0.396 (0.174 — 0.899)	0.027	0.567 (0.281 — 1.143)	0.113
Age	−0.01 (−0.10 — 0.07)	0.813	0.981 (0.948 — 1.015)	0.264	0.991 (0.963 — 1.019)	0.516
San Diego location (vs. other)	2.72 (−0.49 — 5.94)	0.097	4.938 (1.355 — 17.995)	0.015	1.307 (0.458 — 3.735)	0.617
Riverside location (vs. other)	−1.49 (−4.90 — 1.92)	0.389	1.794 (0.459 — 7.014)	0.402	0.357 (0.112 — 1.134)	0.081

Table 3. Adjusted associations between program hours and BBHI 2 domain* scores below the clinical threshold (<84) at the end of treatment

	Subclinical anxiety (binary)	Subclinical depression (binary)	Subclinical functional complaints (binary)	Subclinical pain complaints (binary)	Subclinical somatic complaints (binary)
Variable	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Program hours ($\log_2$)	1.361 (1.115 — 1.661)	1.765 (1.371 — 2.271)	1.572 (1.223 — 2.022)	1.271 (1.028 — 1.570)	1.593 (1.270 — 1.998)
Baseline Oswestry score	0.985 (0.955 — 1.017)	0.979 (0.938 — 1.023)	0.971 (0.940 — 1.003)	0.973 (0.940 — 1.007)	1.016 (0.981 — 1.053)
Baseline Tampa score	0.934 (0.885 — 0.985)	0.984 (0.910 — 1.064)	0.947 (0.899 — 0.998)	0.982 (0.929 — 1.039)	0.973 (0.919 — 1.030)
Baseline BBHI 2 anxiety	0.990 (0.969 — 1.012)	0.970 (0.933 — 1.009)	1.011 (0.989 — 1.033)	1.012 (0.989 — 1.036)	1.006 (0.982 — 1.032)
Baseline BBHI 2 defensiveness	0.985 (0.952 — 1.019)	1.033 (0.963 — 1.108)	1.008 (0.977 — 1.039)	1.024 (0.994 — 1.055)	1.040 (1.003 — 1.077)
Baseline BBHI 2 depression	0.996 (0.970 — 1.023)	1.011 (0.969 — 1.055)	0.994 (0.969 — 1.019)	1.003 (0.975 — 1.031)	1.006 (0.977 — 1.036)
Baseline BBHI 2 functional complaints	0.961 (0.917 — 1.006)	1.021 (0.947 — 1.100)	0.947 (0.909 — 0.988)	1.014 (0.978 — 1.051)	1.018 (0.980 — 1.058)
Baseline BBHI 2 pain complaints	0.990 (0.971 — 1.008)	0.974 (0.944 — 1.006)	0.999 (0.982 — 1.017)	0.944 (0.920 — 0.969)	0.984 (0.963 — 1.006)
Baseline BBHI 2 somatic complaints	0.985 (0.958 — 1.013)	0.963 (0.905 — 1.025)	0.989 (0.963 — 1.015)	1.005 (0.975 — 1.035)	0.976 (0.941 — 1.012)
Male sex	0.707 (0.363 — 1.377)	0.880 (0.348 — 2.225)	1.498 (0.760 — 2.955)	2.995 (1.455 — 6.164)	0.847 (0.408 — 1.761)
Age	1.015 (0.988 — 1.044)	1.026 (0.985 — 1.067)	1.007 (0.980 — 1.035)	1.017 (0.984 — 1.050)	1.019 (0.989 — 1.051)
San Diego location (vs. other)	1.507 (0.519 — 4.377)	1.111 (0.209 — 5.917)	1.788 (0.641 — 4.985)	2.564 (0.846 — 7.770)	0.668 (0.169 — 2.644)
Riverside location (vs. other)	1.281 (0.422 — 3.888)	1.250 (0.221 — 7.060)	1.033 (0.350 — 3.050)	2.803 (0.865 — 9.086)	0.419 (0.104 — 1.691)

Table 4. Adjusted linear regression examining association between Oswestry improvement and program hours, episode duration, and other covariates

	Oswestry improvement (continuous)	
Variable	β (95% CI)	*p*
Program hours ($\log_2$)	4.43 (2.70 — 6.16)	<0.001
Episode duration ($\log_2$)	−2.20 (−4.09 — −0.31)	0.023
Baseline Oswestry score	0.64 (0.45 — 0.83)	<0.001
Baseline Tampa score	−0.09 (−0.39 — 0.21)	0.542
Baseline BBHI 2 anxiety	0.17 (0.04 — 0.29)	0.009
Baseline BBHI 2 defensiveness	0.08 (−0.08 — 0.23)	0.320
Baseline BBHI 2 depression	−0.08 (−0.22 — 0.07)	0.300
Baseline BBHI 2 functional complaints	−0.08 (−0.28 — 0.11)	0.391
Baseline BBHI 2 pain complaints	−0.10 (−0.20 — −0.003)	0.044
Baseline BBHI 2 somatic complaints	−0.11 (−0.25 — 0.04)	0.148
Male sex	0.22 (−3.65 — 4.10)	0.909
Age	−0.06 (−0.22 — 0.10)	0.431
San Diego location (vs. other)	1.94 (−4.13 — 8.00)	0.529
Riverside location (vs. other)	0.27 (−6.06 — 6.60)	0.933

*Defensiveness could not be modeled reliably because 195 of 199 patients (98%) were already below the threshold at treatment completion, leaving only four patients at or above it. That made the adjusted logistic regression unstable.