Sleep changes in adolescents with chronic pain enrolled in intensive interdisciplinary pain treatment

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Introduction

- Children and adolescents with chronic pain are more likely to report difficulty falling and staying asleep, associated daytime fatigue, and decreased energy levels.
- However, few studies track both subjective and objective sleep measures and their impact on daily functioning and mental health.
- We propose that both self-reported and objective measures of sleep and functionality will improve after participation in an intensive interdisciplinary pain treatment (IPT) program.
- We evaluated relationships between sleep changes and measures of pain, disability, anxiety, and depression.

Methodology

This was a prospective, longitudinal study of adolescents with chronic pain age 13-17 who completed a 3-6 week non-pharmacological highly structured intensive interdisciplinary pain treatment program.

Program Admission Criteria:
- Functional Disability
- Failure of Outpatient Treatment

Program Discharge Criteria:
- Achieves PT & OT functional Goals
- Self-directs therapies

Program Structure:
- Outpatient/Day Hospital (Monday – Friday)
- 4-5 hours daily intensive PT and OT
- Daily yoga and/or self-regulation
- Group and individual acceptance-based talk therapy
- Therapeutic art and music
- Twice weekly parent group

62 adolescents with chronic musculoskeletal pain were evaluated at program baseline, weekly during treatment, and again at 1-month after program completion by self-report PROMIS (Patient Reported Outcomes Measurement Information System) measures, sleep diaries, and by actigraphy using Motionlogger watches. Paired samples t-tests were conducted with SPSS (V.23) and supplemented with hierarchical linear modeling (HLM) for time-series analyses.

Table 1. Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean±S.D.</th>
<th>n(%), or Median (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>13.6±1.7</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>51 (84%)</td>
<td>female</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>8 (13%) 1 Asian American</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>55 (88%) white, 3 (5%) Black or biracial, 2 (3%) Asian American</td>
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<tr>
<td>Pain duration (years)</td>
<td>3.8±3.1</td>
<td></td>
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<tr>
<td>Primary pain diagnosis</td>
<td>46 (74%) widespread, 12 (19%) localized or CRPS, 2 (3%) other</td>
<td></td>
</tr>
<tr>
<td>Weeks in program</td>
<td>13 (11) 1-3 weeks, 33 (53%) 4 weeks, 13 (21%) 5 weeks, 9 (15%) 6-7 weeks</td>
<td></td>
</tr>
<tr>
<td>Impairment (FDI)</td>
<td>23.8±10.9</td>
<td></td>
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<tr>
<td>Parent-reported impairment (FDI)</td>
<td>24.4±10.9</td>
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</tbody>
</table>

Results

- Participants reported difficulty falling and staying asleep at baseline with statistically significant improvement at 2-week follow up (p<0.01). Impairment (measured with FDI) improving by program end and through follow up (p<0.001). Statistically significant improvements were also observed at program end for sleep satisfaction, energy level, and daytime fatigue, with continued improvement at the 2-week follow up (all p<0.01).

Summary/Conclusion

- Children with chronic musculoskeletal pain report sleep impairments and decreased energy function. This was a prospective, longitudinal study of adolescents with chronic pain age 13-17 who completed a 3-6 week non-pharmacological highly structured intensive interdisciplinary pain treatment program. HLM supports the difference in these trajectories (p<0.001).

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intercept</th>
<th>Pain</th>
<th>Functioning</th>
<th>Anxiety</th>
<th>Depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prob. falling asleep</td>
<td>.06***</td>
<td>.01</td>
<td>.04***</td>
<td>.01</td>
<td>.08*</td>
</tr>
<tr>
<td>Prob. staying asleep</td>
<td>.06***</td>
<td>.01</td>
<td>.04***</td>
<td>.01</td>
<td>.08*</td>
</tr>
<tr>
<td>Daytime fatigue</td>
<td>2.54*</td>
<td>.02</td>
<td>.53***</td>
<td>.08</td>
<td>.37***</td>
</tr>
</tbody>
</table>

Summary:
- Self-reported levels of fatigue greater in participants who reported more severe depression at baseline, but improved to similar levels following program. HLM supports the difference in these trajectories (p<0.001).

Table 2: HLM analysis of subjective sleep outcomes, with other predictors in model

Figure 1: Changes in Objective Sleep Variables (by actigraphy)

Figure 2: Self-reported measures of sleep, impairment, anxiety and depression

Figure 3: Changes in fatigue correlated to measured level of depression.

Summary: Actigraphy shows mild improvement in latency to persistent sleep and sleep onset latency; however, none of the objectively measured variables reached statistical significance by end of program or at 2 week follow up (all p>0.01).

Summary:
- For difficulty falling asleep, change in pain-related disability is the best predictor of improvement. For difficulty staying asleep, changes in pain intensity and pain-related disability both predict improvements. For fatigue, changes in depression and pain-related disability are related to improvement.

- After completion of the program, patients reported statistically significant improvements in sleep satisfaction, difficulty falling asleep, energy level, and daytime fatigue.
- However, improvements on objective (actigraphy-based) measures were not statistically significant.
- Improvements in sleep satisfaction and difficulty falling asleep were correlated with improvements in daily functioning.
- Improvement in depression was a strong predictor for less daytime fatigue, a relationship that needs further exploration.
- Long-term follow up is needed to determine reasons for the discrepancy between subjective and objective changes.