



AOTA Critically Appraised Papers Series

Evidence Exchange

**A product of the American Occupational Therapy Association's Evidence-Based Literature Review Project*

CRITICALLY APPRAISED PAPER (CAP)

Focused Question

Is greater progress with contracture resolution made with participants who utilized a splint wearing schedule of 6–12 hours/day or 12–16 hours/day?

Glasgow, C., Fleming, J., Tooth, L. R., & Peters, S. (2012). Brief Report—Randomized controlled trial of daily total end range time (TERT) for Capener splinting of the stiff proximal interphalangeal joint. *American Journal of Occupational Therapy*, 66, 243–248.
<http://dx.doi.org/10.5014/ajot.2012.002816>

CLINICAL BOTTOM LINE:

This research used a randomized control trial to determine which daily total end range time (TERT) was more effective: 6–12 hours or 12–16 hours? The study found no significant difference in either of these methods. Mean daily improvement in active range of motion (ROM) for Group 1 was 9.5° and 11.5° for Group 2 ($p < .13$); mean improvement in passive ROM was 18.4° for Group 1 and 18.1° for Group 2 ($p < .46$); mean improvement in torque ROM was 9.2° for Group 1 and 12.8° for group 2 ($p < .26$). However, several need to be considered before utilizing either of these daily TERT methods. First, there was a moderate dropout rate that affected the sample size. The small sample size limited the power of the statistical analyzes that would cause distortion of the possible significance. Also, weakening the power of the statistical analyses was the 78% contamination of the groups due to crossover of participants into the other treatment group. Based on these limitations, this study found that it may not be clinically practical to expect patients to comply with a daily TERT beyond 12–14 hours, and more research needs to be done with a larger sample size and more defined parameters for the experimental groups to ensure the power of the statistical analyses.

RESEARCH OBJECTIVE(S)

Compare the effect of daily splint TERT of 6–12 hours vs. 12–16 hours of patients wearing Capener splinting for proximal interphalangeal (PIP) joint extension deficits.

DESIGN TYPE AND LEVEL OF EVIDENCE:

Randomized control trial (RCT)
Level I

Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *Circle yes or no, and if no, explain.*

YES NO

The study design type was appropriate for the knowledge level about this topic, because an RCT offers the highest level of evidence.

SAMPLE SELECTION

How were subjects selected to participate?

Purposive sampling was used. Participants were recruited from a hand clinic at EKCO at Occupational Services from 2004 to May 2008. This sample was pulled from a larger group of patients with deficits in either metacarpal phalangeal (MCP) joint or PIP joints who were involved with a previous splinting project the therapists had conducted.

Inclusion Criteria

- Patients were included in the study if they have
- A history of traumatic injury resulting in an extension deficit of the PIP joint, which must have had passive ROM equal to or less than 80% that of the unaffected side.
 - Given consent.

Exclusion Criteria

Patients who had previously used dynamic splinting for the presenting injury who had with abnormal tone, paralysis associated with central nervous system dysfunction, acute complex regional pain syndrome, inflammatory arthritic conditions, infections, or artificial joints were excluded.

SAMPLE CHARACTERISTICS

N = 22

% Dropouts	(4 Dropouts before 8 weeks) 18%	
#/ (%) Male	14/64%	#/ (%) Female 8/36%
Ethnicity	White: 95% Asian: 5%	
Disease/disability diagnosis	Traumatic injury resulting in extension deficit of PIP joint.	

Check appropriate group:

<20/study group	20–50/study group	51–100/study group	101–149/study group	150–200/study group
✓				

INTERVENTION(S) AND CONTROL GROUPS

Group 1:

Brief Description	A dynamic Capener splint was fabricated, and the mobilizing force was set to 200–250 g. This was applied for 30 minutes, and a change in active ROM was recorded. The participants were randomly allocated to this group and received a standard core treatment program, including dynamic splinting, active ROM motion and assisted ROM, and edema management.
Setting	Outpatient hand clinic.
Who Delivered?	Principal researcher.
Frequency?	The splint was worn for 6–12 hours daily.
Duration?	8 weeks.

Group 2:

Brief Description	A dynamic Capener splint was fabricated, and the mobilizing force was set to 200–250 g. This was applied for 30 minutes, and a change in active ROM was recorded. The participants were randomly allocated to this group and received a standard core treatment program, including dynamic splinting, active ROM and assisted ROM, and edema management.
Setting	Outpatient hand clinic.
Who Delivered?	Principal researcher.
Frequency?	The splint was worn for 12–16 hours daily.
Duration?	8 weeks.

Intervention Biases: *Circle yes or no and explain, if needed.*

Contamination

YES NO

78% of the 12–16 hours/day participants crossed over to the 6–12 hours/day group because they continually wore their splint for a max of 12 hours per day.

Co-intervention

YES NO

No co-intervention bias.

Timing

YES NO

This research spanned over 2 months, when general recovery for PIP injury takes 3 to 4 months.

Site

YES NO

Outpatient hand clinics at EKCO in Brisbane, Queensland, Australia.

Use of different therapists to provide intervention

YES NO

The same principal researcher did the initial evaluation and all interventions.

MEASURES AND OUTCOMES

Complete for each relevant measure when answering the evidence-based question:

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article--yes/no/NR [not reported]), and how frequently the measure was used.

Standard silver finger goniometer was used to measure the passive and active ROM. Reliability and validity were not reported. Measured prior to beginning of intervention and at the end of 8 weeks.

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article--yes/no/NR [not reported]), and how frequently the measure was used.

Torque ROM was measured with the standard silver finger goniometer and the Haldex tension gauge. Measuring torque ROM was found to be highly reliable as stated in the article by Glasgow et al. (2003). This was used prior to beginning of intervention and at the end of 8 weeks.

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article--yes/no/NR [not reported]), and how frequently the measure was used.

Modified Weeks Test measured joint stiffness. Reliability and validity were not stated. This was used as a part of the initial evaluation prior to intervention when the Capener splint was fabricated. The splint was applied for 30 minutes to every patient, then their active ROM was recorded as the estimate of joint stiffness.

Measurement Biases

Were the evaluators blind to treatment status? Circle yes or no, and if no, explain.

YES NO

The study frequently used the term *blinding* when referring to group allocation, meaning that the participants were unaware of the other research group; however, the participants could see the splint they had, knew the wearing schedule, and knew what the investigator was measuring, making this study's blinding questionable.

Recall or memory bias. *Circle yes or no, and if yes, explain.*

YES NO

No recall or memory bias found.

Others (list and explain):

N/A

RESULTS

List results of outcomes relevant to answering the focused question

Include statistical significance where appropriate ($p < 0.05$)

Include effect size if reported

No results were found to have significant relationship between groups. The mean daily TERT equaled 9.5 hours/day for Group 1 and 11.5 hours/day for Group 2. The mean improvement in active ROM was 16.7° for Group 1 and 19.1° for Group 2. The mean improvement in passive ROM was 18.4° for Group 1 and 18.1° for Group 2. Finally, mean improvement in torque ROM was 9.2° for Group 1 and 12.8° for Group 2.

Was this study adequately powered (large enough to show a difference)? *Circle yes or no, and if no, explain.*

YES NO

The sample size was 18, with an even 2 groups (9 to each group) to begin the study. By 8 weeks, 7 participants in one group crossed over to the other group, which severely affected the power.

Were appropriate analytic methods used? *Circle yes or no, and if no, explain.*

YES NO

This study used 3 simple linear regression analyses in SPSS Version 17 to predict change in active ROM, passive ROM, and torque ROM.

Were statistics appropriately reported (in written or table format)? *Circle yes or no, and if no, explain.*

YES NO

Table 1 (p. 246) and Table 2 (p. 247) show clear depictions of the results.

CONCLUSIONS

State the authors' conclusions that are applicable to answering the evidence-based question.

Most participants were unable to wear a fairly unobtrusive finger-based Capener splint for more than 12 hours per day, suggesting that it may not be clinically practical to expect patients to comply with a daily TERT beyond 12 to 14 hours. The benefits of small gains in ROM should be weighed against the need for prolonged immobilization in the splint.

This work is based on the evidence-based literature review completed by Cody Ellis, OTS.

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