Furia JP, Willis FB, et al. Systematic Review of Contracture Reduction in the Lower Extremity with Dynamic Splinting. Adv Ther 2013;30:763-770.

Design: systematic review

Purpose of study: to evaluate the safety and efficacy of dynamic splinting to treat joint contracture in the lower extremities, and to determine if total hours or total weeks of stretching influenced outcomes

Reasons not to cite as evidence:

- The included studies are mostly case series and only one randomized trial, which involved the first metatarsophalangeal joint
- The main outcome is change in active range of motion after beginning the use of a dynamic splint
    - However, one of the studies (Lai et al 2008) studied passive ROM, one (Kalish et al 2009) studied toe dorsiflexion without specifying whether it was passive or active, and one study in rat knee joints could not have credibly been active ROM
- Some of the articles deal with populations outside the scope of a workers' compensation guideline: Lopez 2010 deals with diabetes patients and Lai 2008 deals with stroke and traumatic brain injury patients, where the risk factors for contracture differ from those of workers' compensation patients
- The authors combine ROM measurements from the ankle, the toe, and the knee, as if the number of degrees of gain of active ROM is expected to be the same in the toe as in the knee; the biomechanical basis for this assumption, which would justify the calculation of the average number of degrees of change in ROM, requires some elaboration which was not forthcoming
- One of the references for the knee in table 1 (reference #17) is listed in the references only as "data on file" in the custody of one of the authors; one of the knee references involves rats, and the third knee reference is in German, but the abstract of that article makes it clear that no comparisons between different treatments were made
- The authors calculated correlations between hours of application of splinting, weeks of duration of splinting, and sample sizes (number of patients) in the included studies, and reported that the total hours of use and the weeks of use were correlated with one another, but not with the numbers of participants in the studies
    - It is almost certain that there will be a correlation between the weeks of use and the total hours of use, and there is no reason to look for a correlation between these variables and the number of participants in a study
    - The authors say of the lack of correlation, "This suggests that there was an outlier in each weighted dependent variable," but there is no reason to suppose

that the lack of correlation is due to an outlier; it may be due to a lack of correlation in the real world between the uncorrelated variables

- Table 2 reports means and standard errors for three distinct weighted variables: hours-weighted ROM, duration-weighted ROM, and sample size weighted ROM
    - For each of these, the standard error of the estimate is exactly 0.750
    - It is extremely unlikely that three distinct variables will have exactly the same standard error (the standard deviation divided by the square root of the sample size); the table is uninterpretable
    - In addition, the weighted sample size range of motion in Table 2 is a negative number (-0.514), which is highly cryptic, since sample size and range of motion are both expressed as positive numbers
- Using Microsoft Excel and the statistical software SPSS, it is possible to reproduce the numbers in Table 1 and to reproduce the correlation coefficient the authors report (0.883, p=0.002) in the Results section
    - Reproducing the numerical data makes it possible to explore the relevance of one of the variables emphasized by the authors, namely the weights (W1, W2, and W3 in Table 1)
    - It is possible to set up a linear regression between each of the weighted variables and the main outcome of AROM, and separately to set up linear regression between the original variables (hours of use of dynamic splinting, number of subjects, and weeks of use of dynamic splinting)
    - The results of the regressions of the weighted variables are essentially identical to the results of the original variables
        - The total sum of squares, the regression sum of squares, and the residual sum of squares, are exactly identical
        - This is because the “weighted” variables are the original variables divided by a constant, meaning that the relationships between the variables and the outcome AROM will be identical
        - It appears that the “weighting” of the original variables serves no purpose except to confuse the reader

References:

Lai J, Jones M, Willis B.. Effect of dynamic splinting on excessive plantar flexion tone/contracture: a controlled, cross-over study. Proceedings of the 16th European Congress of Physical and Rehabilitation Medicine. Minerva Medica pubs, Italy, August 2008, pp 106–9.

Lopez AA, Kalish SR, John MM, Willis FB. Reduction of ankle equinus contracture secondary to diabetes mellitus with dynamic splinting. Foot Ankle Online J. 2010;3(3):13–8.

Kalish SA, Willis FB. Hallux limitus and dynamic splinting: a retrospective series. Foot Ankle Online J. 2009;2(4):1.