

IMPORTANT UPDATE FOR ProFouND Cascade Trainers

Pre-exercise stretching debate prepared by Prof Dawn Skelton October 2016

This debate has been ongoing for 13 years! Twice (maybe 3 times) I have been asked by students my views on this as some research has shown that pre-exercise stretching can affect proprioceptive feedback and muscle power. There is still little research on this – and still mostly in younger people and mostly athletes! Pre-exercise stretching has been included mostly because the ACSM (American College of Sports Medicine) recommended this following the belief that pre-exercise stretches may reduce the likelihood of tendon injury during exercise.

Here is a précis of the evidence base so far (**studies highlighted in red are in 'somewhat older people!!'**)

2014 - <http://www.ncbi.nlm.nih.gov/pubmed/24936897> - this paper showed that long duration stretches pre-exercise (>60 sec) caused a reduction in a jump height (power) compared to no pre-exercise stretching. There was no significant (there was a trend but not significant) reduction if the stretch was held for <30 seconds. This was in 16 young physically active men.

2013 - <http://www.ncbi.nlm.nih.gov/pubmed/22316148> - this is a systematic review of the literature on pre-exercise stretching research papers (104 studies). There was a dose-responsive effect on strength, power and explosive performance. The authors noted that these effects were not related to subject's age, gender, or fitness level; however, they were more pronounced in isometric vs dynamic tests, and were related to the total duration of stretch, with the smallest negative acute effects being observed with stretch duration of ≤ 45 s. They concluded that the usage of pre-stretching as the sole activity during warm-up routine should generally be avoided.

In other words, no discussion about mobility or circulation boosters and whether these moderated effects. No studies looked at stretches as brief as 8-12 seconds (our suggested duration of hold), in fact the shortest was 86sec!. The mean age was 22! In all these studies and included only one on older women (see Gurjao et al 2009 below). Therefore if I had reviewed this paper I would have argued that they cannot say there is no effect of age, all other studies were people aged 9-22!

2012 - <http://www.ncbi.nlm.nih.gov/pubmed/23486744> - this small study in young men found that 30s quad stretches did not affect knee joint proprioception.

2012 - <http://www.ncbi.nlm.nih.gov/pubmed/23174542> - this review looked at static and dynamic flexibility stretches on performance. Static flexibility programs have been shown to improve joint range of motion and tolerance to stretch but do not appear to reduce the risk of musculoskeletal injury and may impair muscle performance immediately after a static

stretch. Dynamic flexibility, on the other hand, may enhance power and improve sports-specific performance. All studies reviewed were in young people.

2011 - <http://www.ncbi.nlm.nih.gov/pubmed/21735398> - this is a systematic review of the literature on studies looking at whether pre- or post-stretching reduces delayed onset muscle soreness after exercise. The authors concluded that stretching does not produce clinically important reductions in delayed-onset muscle soreness in healthy younger adults. However, same as 2013 review, only young people and stretches held for much longer (before and after exercise) than we do in our programmes.

2011 - <http://www.ncbi.nlm.nih.gov/pubmed/22014144> - this study compared stretching (static and dynamic) effects on subsequent exercise performance in young and middle aged (av. 46.3 yrs) men. The static pre-exercise stretches reduced jump height and there was no obvious differences between young and older men. Dynamic stretches appeared to improve performance.

2010 - <http://www.ncbi.nlm.nih.gov/pubmed/20962924> - this study looked at a variety of conditions including aerobic warm up and static stretch (6 reps 6 s hold), aerobic activity before and after stretches and just static stretches on performance of young female athletes. None of these improved performance compared to no pre-exercise activity. The condition with aerobic activity for 5 mins, static stretches and then another aerobic activity for 10 mins was the best at enhancing range of motion during exercise.

2010 - <http://www.ncbi.nlm.nih.gov/pubmed/19816214> - this study assessed the effects of an acute static stretching protocol on balance and jump/hop performance in active middle-aged adults (from a Tai Chi school). No significant differences were found between the group means of the stretch and no-stretch conditions for the dependent measures of broad jump, single hop, triple hop, crossover hop, and 6-m timed hop performance. The authors concluded that ten minutes of acute static stretching enhances dynamic balance and does not affect jump/hop performance in active middle-aged adults. Static stretching should be included before competition and before exercise in fitness programs of active middle-aged adults. It should be noted that they performed stretches for 10 minutes and the stretches were held for 30 s (not something we have done in our programmes).

Gurjao (2009) - <http://www.ncbi.nlm.nih.gov/pubmed/19855345> - One study looked at 23 women mean age 64.6 and pre-exercise stretches of 90 seconds – a 10% reduction in power compared to no stretching. Considering this ONE study in older women had the third biggest reduction in power but with the shortest duration stretch I think this lends weight to the fact that older people will have more acute effects short term from pre-exercise stretching than younger people! The authors conclude that older women's capacity to produce muscular force decreased after their performance of static stretching exercises.

2009 - <http://www.ncbi.nlm.nih.gov/pubmed/19254611> - this study looked at 30 younger men and women and effect of pre-exercise static stretches on balance performance. The stretching did not significantly affect muscle responses or performance during balance tests.

2008 - <http://www.ncbi.nlm.nih.gov/pubmed/18978623> - this study looked at performance following different durations and reps of static stretches in young men. The stretching protocol influenced Bench Press endurance, the longer the hold (>45 secs) and the more reps were done the larger the reduction in endurance. On the other hand, a low volume of

static stretching (<15 secs) does not seem to have a significant effect on muscular endurance.

2006 - <http://www.ncbi.nlm.nih.gov/pubmed/17207437> - this article reviewed the effect of pre-stretching the Achilles tendon on subsequent muscle injury. Little definitive evidence exists that clearly demonstrates the efficacy of stretching in reducing injury. Recent prospective studies have contended that reductions in plantarflexor strength and increases in ankle dorsiflexion range of motion from stretching the Achilles tendon may increase the risk of injury. Although many theories have been published regarding the potential benefits and limitations of stretching, few studies have been able to definitively demonstrate its utility in injury prevention.

2006 - <http://www.ncbi.nlm.nih.gov/pubmed/17119516> - this article looked at 16 young men and women and subjected them to 15s or 30s static hamstring stretches (or none as control) and then looked at strength immediately afterwards. Both durations of stretch were sufficient to impair muscle performance and the duration of stretch did not influence the degree of force loss. They concluded that inclusion of pre-exercise stretches, even with short stretch durations, in preparation for strength activities is not appropriate.

2004 - <http://www.ncbi.nlm.nih.gov/pubmed/15292749> - this study looked at the effect of an acute bout of lower limb static stretching on balance, proprioception, reaction, and movement time. Sixteen youngsters were tested before and after both a static stretching of the quadriceps, hamstrings, and plantar flexors or a similar duration control condition. The stretching protocol involved a 5-min cycle warm-up followed by three stretches to the point of discomfort of 45 s each with 15-s rest periods for each muscle group. There was a significant decrease in balance scores with the stretch (decreasing 9.2%) compared with the control (increasing 17.3%) condition. Similarly, decreases in reaction (5.8%) and movement (5.7%) time with the control condition differed significantly ($P < 0.01$) from the stretch-induced increases of 4.0% and 1.9%, respectively. The authors concluded that an acute bout of stretching impaired the warm-up effect achieved under control conditions with balance and reaction/movement time.

1998 - <http://www.ncbi.nlm.nih.gov/pubmed/11676730> - this study looked at calf-stretching in army recruits prior to long marches and noted no reduction in injury with pre-stretching compared to not.

So in conclusion – whilst the evidence is still NOT equivocal that stretches in the warm up impair performance (power, proprioceptive feedback etc) there is also NO evidence that they do anything to help performance or reduce injuries! As we already have a long warm up and mobility exercises for the joints we are about to work, LLT have decided to remove them! We of course want to keep the developmental stretches at the as there is evidence that these increase range of motion over time and are a nice relaxed part of the cool down.