

## Warm-Up Habits Of Highly-Skilled Golfers Prior To Practice And Tournament Conditions

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### Biomechanics and Physiology

#### Purpose

Extensive research has highlighted that the incorporation of a warm-up can significantly improve clubhead speed (Moran et al., 2009; Fradkin et al., 2004), ball speed (Moran et al., 2009), swing path (Moran et al., 2009), and centeredness of strike (Tilley & Macfarlane, 2012; Moran et al., 2009). Research conducted by Fradkin et al., (2003) surveyed 1040 amateur golfers based on their attitudes towards pre-performance preparation, with 70% of the golfers indicating they never or seldom warm-up. With only 5.8% of their sample holding a handicap between 0-10, it indicates that the sample predominantly consisted of lower-skilled golfers. Whilst this provides some indication as to the pre-performance preparation habits of golfers, there is no evidence to date that has sought to establish the warm-up habits of highly-skilled golfers across both practice and tournament conditions. Using an observational study, Bridge et al., (2008) evidenced that Ladies European Tour golfers (n=25) performed a mixture of static and dynamic stretches which ranged from 27-29 seconds over consecutive tournament days. Whilst this provides evidence of the 'observed' warm-up practices of elite golfers prior to tournament rounds (TR), there is a paucity of evidence surrounding warm-up habits prior to driving range practice sessions (RS) and practice rounds (PR).

The aim of this current study was to analyse the warm-up habits of highly-skilled golfers prior to 3 practice / tournament conditions ([RS], [PR] and [TR]).

## Methods

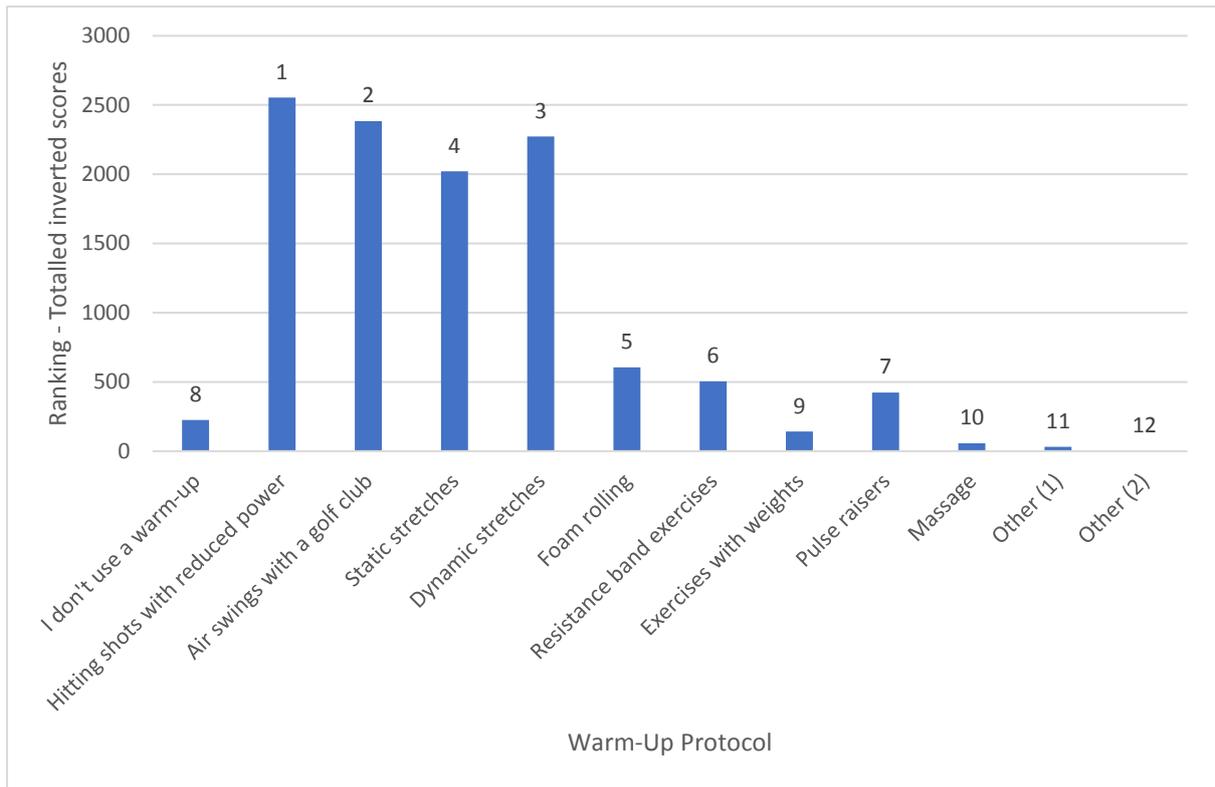
Professional and category-1 golfers were recruited using convenience sampling ( $n = 307$ ; Professionals = 279; Amateurs = 28; Males = 278; Females = 29; Age  $24.54 \pm 5.58$  years). All golfers provided informed consent and completed an online mixed methods survey (using Qualtrics). Golfers responded to questions assessing their individual warm-up protocols, the order in which they performed these exercises, and the duration of their warm-up prior to engaging in a RS, PR and TR. Ordering ranks were given an inverted score and totalled for each protocol across the sample to provide a measure of the most preferential warm-up used. A repeated measure ANOVA with Bonferroni post-hoc analysis was used to analyse warm-up durations across the three conditions.

## Results

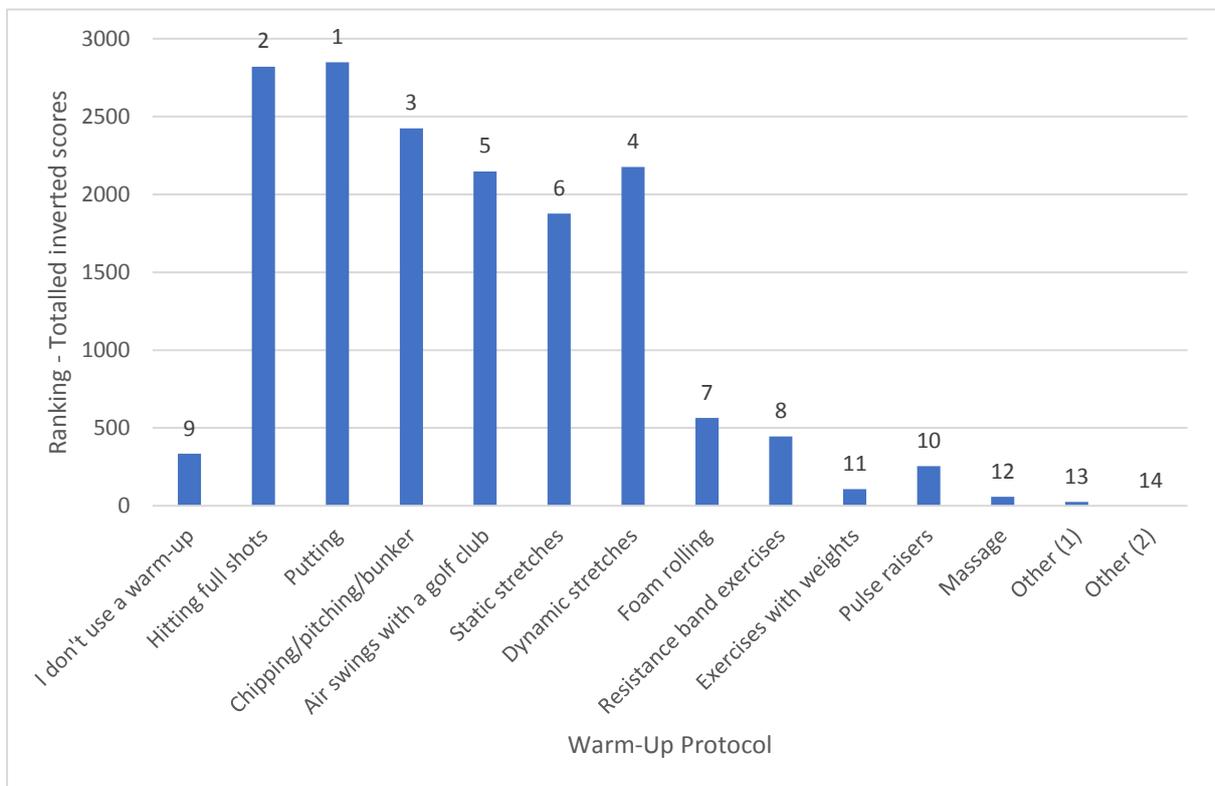
Descriptive statistics indicated that a slightly increased percentage of golfers undertake a warm-up prior to playing a tournament round (95.11%) compared to both a range session (92.83%) and a practice round (91.86%).

The results of this study indicate that the duration of warm-up was significantly affected by the type of condition (RS, PR, TR), ( $F(1.84, 513.18)=146.98, p<.001, \eta^2=.345$ ). Bonferroni post-hoc analysis revealed a significant increase in warm-up duration from the RS ( $13.06 \pm 13.34$ mins) to both the PR ( $26.95 \pm 19.07$ mins,  $p<.001$ ) and TR ( $37.43 \pm 19.74$ mins,  $p<.001$ ) and from the PR to TR ( $p<.001$ ).

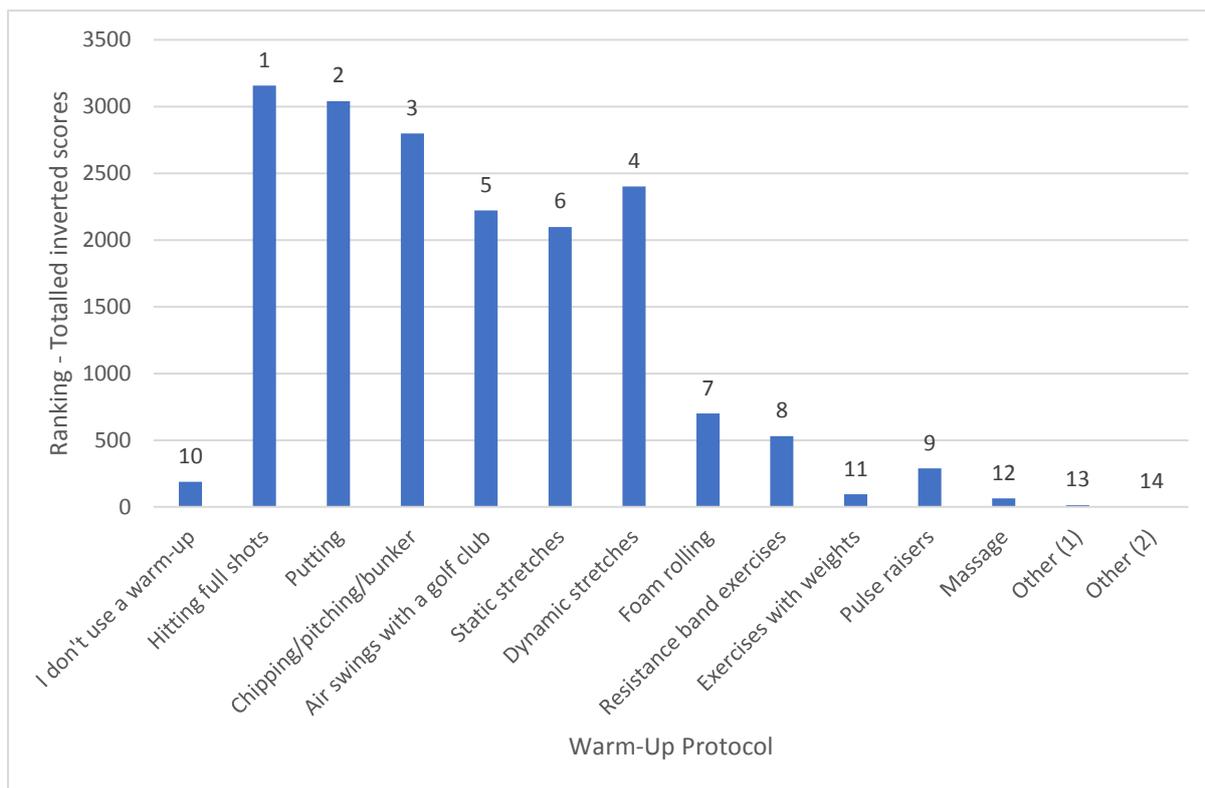
Figures 1-3 demonstrate the ranking order for warm-up protocols in each of the three conditions.



**Figure 1.0** Average warm-up scores and rankings prior to RS



**Figure 2.0** Average warm-up scores and rankings prior to PR



**Figure 3.0** Average warm-up scores and ranking prior to TR

Further analysis revealed the most frequent warm-up protocols employed under each condition (Table 1.0).

**Table 1.0** Three most frequent highest ranked warm-up protocols from each practice / tournament condition

Condition	1 <sup>st</sup> Ranked Protocol	2 <sup>nd</sup> Ranked Protocol	3 <sup>rd</sup> Ranked Protocol
Range session	Static stretches	Dynamic stretches	Hitting shots with reduced power
Practice round	Static stretches	Dynamic stretches	Air swings with a golf club
Tournament round	Static stretches	Dynamic stretches	Air swings with a golf club

## Discussion

This study has examined a large-scale comparison of the warm-up habits of highly-skilled golfers in RS, PR and TR conditions with findings revealing that warm-up durations significantly increase across

the 3 conditions respectively. Golfers appear to be employing different warm-up strategies prior to a TR, which, if not rehearsed during practice or used regularly may not result in the performance enhancements that they are seeking (e.g. increased clubhead speed). Static stretching has previously been shown to significantly reduce force production (e.g. Power et al., 2004), clubhead speed, drive distance, accuracy and centeredness of strike (Gergley, 2009). Given this, it is a concern that highly-skilled golfers have most frequently ranked this as the 1<sup>st</sup> protocol used within their warm-up prior to all 3 conditions.

### **Practical Application/Clinical Relevance**

There are significant variations within the applications of a warm-up prior to each of the practice and tournament conditions. It would therefore be advised that golfers should conduct an individualised warm-up that is standardised across each of these conditions and where possible, avoid the use of static stretching in order to enhance performance. Golfers should aim to practice different warm-up routines to quantify and optimise the effect these have on their individual impact factors and ball flight. This process would be enhanced by collaborating with strength and conditioning coaches and biomechanists. Further still, there should be continued education of golfers and PGA Professionals with regards warm-up protocols that can benefit or hinder golf performance.

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