



Efficacy of Dynamic Warm Up or Ballistic Stretching on Jump Height, Speed, or Agility

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Background

- Traditionally, athletes have used static stretching as a warm up routine in order to improve performance and decrease the risk of injury ¹. There is no evidence to date that demonstrates that static stretching has any benefits for sport performance before exercise ².
- Dynamic warm up is a controlled moderate to high intensity sport specific movement-based exercise through participant’s range of motion (Andrejic, 2012, Bacurau, 2009, Fletcher, 2010, Ayala, 2014)
- Ballistic stretching is performed by athletes performing repeated rapid end of range stretching of a specific muscle (Covert, 2010, Jagers, 2008, Samuel, 2008, , Unick, 2005, Woolstenhulme, 2006).

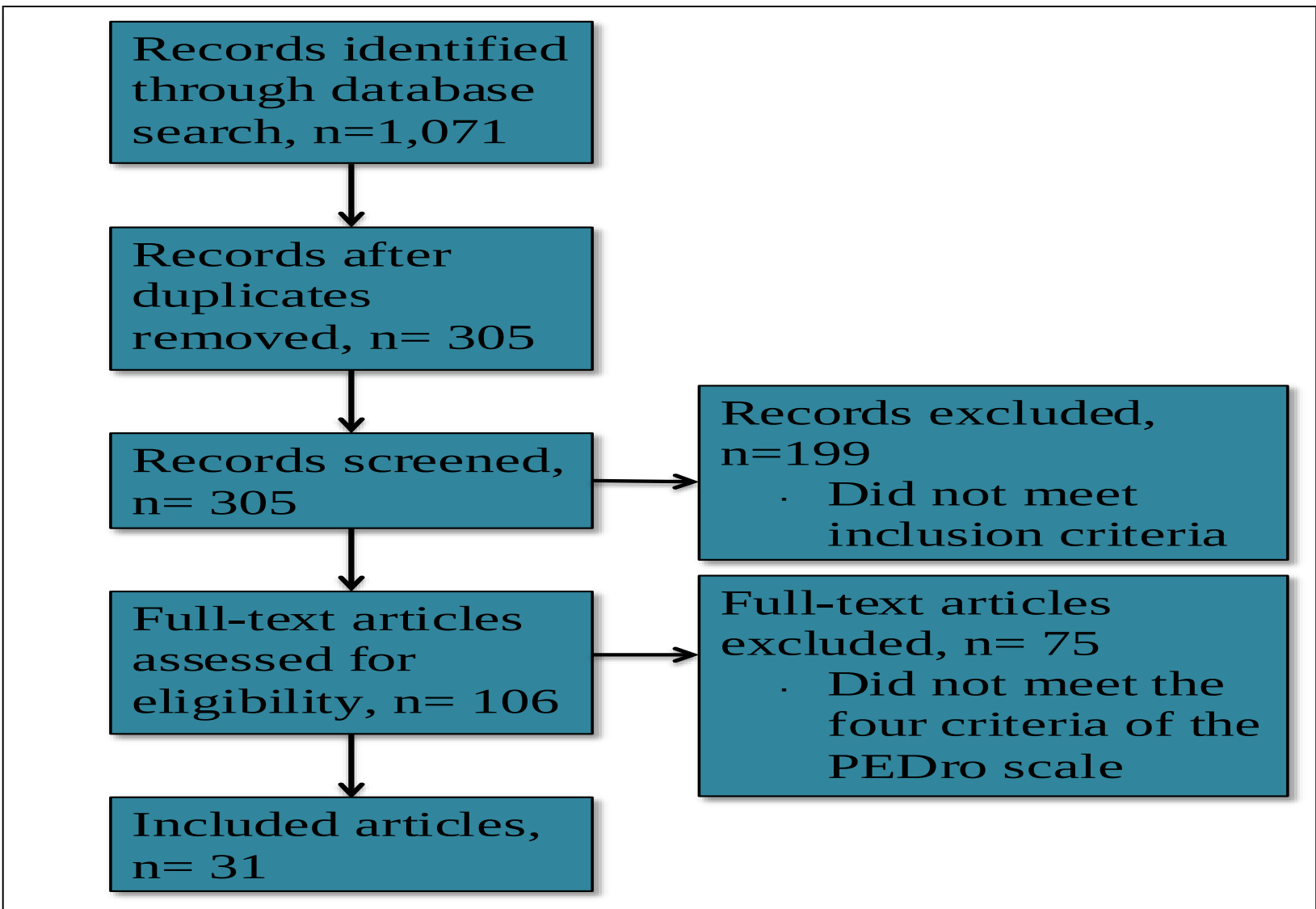
Purpose

- Perform a systematic review on recent literature to review the efficacy of a dynamic warm up or ballistic stretching protocol on jump height, speed, and agility.

Methods

- An electronic bibliographical search was conducted by all three reviewers (AH, JL, and TP) through the following databases, beginning with CINAHL, PubMed, SPORTDiscus, the Physiotherapy Evidence Database (PEDro), and lastly in CINAHL using specific databases of CINAHL, SPORTDiscus, and Medline.
- Search terms “dynamic warm up”, “dynamic stretching”, and “ballistic stretching” were used and combined in a systematic sequence.
- Studies that were included in this review were required to fulfill the following criteria:
 - Comparison of dynamic warm up or ballistic stretching to an alternate condition or control group
 - Was in English, full text, human participants were used, and in a peer-reviewed journal
 - Level of evidence was assessed as a 3 or above using The Oxford 2011 Levels of Evidence (citation), or was a within-subject design
- Met all four of the following criteria from the PEDro scale:
 - Participants were randomly allocated to groups or were randomly allocated an order in sequence of conditions being performed
 - Measure at least one key outcome (jump height, speed, and/or agility)
 - Results of between-group statistical comparisons were reported
 - Study provides a measure of variability for the outcomes (SD) (PEDro scale)

Schematic Breakdown of Literature Search Results



Articles vs. Outcome Measures

	Agility: Static Stretching	Agility: Dynamic Warm up	Vertical Jump: Static Stretching	Vertical Jump: Dynamic Warm up	Speed: Static Stretching	Speed: Dynamic Warm up
Amiri-Khoransani et al (2010)	=	+				
Bishop and Middleton (2013)	=	=	=	=	=	=
Bryne et al (2014)						+
Chaouachi et al (2010)	=	=	=	=	=	=
Curry et al (2009)			=	=		
Dalrymple et al (2009)			=	=		
Faigenbaum et al (2006)			-	+	-	+
Fletcher and Jones (2004)					-	+
Fletcher and Anness (2007)					-	+
Fletcher (2010)				+		
Fletcher and Monte-Colombo (2010)	-	+	-	+	-	+
Gelen (2011)			-	+		
Gunsoo et al (2011)					=	+
Herman and Smith (2008)	=	+			=	+
Jagers et al (2008)				=		
Kistler et al (2010)					-	+
Morrin and Redding (2013)			-	+		
Murphy et al (2010)			=	=		
Needham et al (2009)			-	+	-	+
Pagaduan et al (2012)			-	+		
Paradis et al (2014)			-	-	-	=
Ryan et al (2014)				+		
Samson et al (2012)					=	=
Siatras et al (2003)					-	=
Turki et al (2011)				+		
Turki-Belkhiria (2014)			+	+	=	+
Total	0 (+), 1 (-), 4 (=)	3 (+), 0 (-), 2 (=)	1 (+), 9 (-), 5 (=)	12 (+), 1 (-), 6 (=)	0 (+), 8 (-), 6 (=)	10 (+), 0 (-), 5 (=)
Detailed assessment of outcome measures with static stretching and/or dynamic stretching. (+): Positive effect, (-): Negative effect, (=): No significant difference						

	CINAHL	PubMed	SPORTDiscuss	PEDro	CINAHL (Medline, SPORTDiscus, & CINAHL included)	TOTAL
Search Terms						
Dynamic Warm Up	30	38	73	0	140	281
Dynamic Stretching	52	80	160	17	291	600
Dynamic Warm Up AND Dynamic Stretching	3	5	5	0	14	27
Ballistic Stretching	14	17	38	4	70	143
Ballistic Stretching AND Dynamic Warm Up	0	0	0	0	10	10
Ballistic Stretching AND Dynamic Stretching	2	2	6	0	0	10
TOTAL	101	142	282	21	525	1071

Results

Although there is conflicting evidence showing a dynamic warm up protocol improves one’s jump height, speed and agility, studies found that a dynamic warm up protocol does not negatively affect one’s performance.

•Jump Height - There was some good evidence that dynamic warm up increased ones vertical jump height before competition. There was also some evidence that showed dynamic warm up did not hinder ones performance and there was very little evidence that showed dynamic warm up hindered performance.

•Speed - Although there is conflicting evidence showing a dynamic warm up protocol significantly improves an athlete’s sprint performance, the majority of the literature supports incorporating a dynamic warm up protocol as compared to a static stretching protocol to enhance an athlete’s sprint performance. The articles’ additional findings demonstrate that dynamic stretching does not negatively affect sprint performance whereas static stretching did.

•Agility - Inconsistent evidence was found on the positive effects of dynamic warm up on one’s agility. Evidence was found that combining static stretching with a dynamic warm up protocol does not appear to have an advantage over performing static stretching or a dynamic warm up protocol alone.

Discussion/Conclusions

Based on this systematic review, dynamic warm up exercises, either performed alone or in conjunction with other interventions, improves jump height, speed, and agility of athletes. The data showed that static stretching may be detrimental to an athlete’s performance if performed prior to activity in multiple studies. Based on the articles found, athletes, coaches, trainers, and physical therapists should consider the positive effects of performing dynamic warm up exercises either acutely (before practice or competition) or in a daily program. Further investigation of randomized controlled trials and within-subject design studies need to be performed to find a greater correlation between performance and dynamic warm up exercises and could possible modify the present conclusions.

Acknowledgements

Dr. Jim Farris, Dr. Jim Roush, and Catherine Ryczek



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Mentor: Dr. Jim Farris

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Background

- Traditionally, athletes have used static stretching as a warm up routine in order to improve performance and decrease the risk of injury. There is no evidence to date that demonstrates that static stretching has any benefits for sport performance before exercise.
- Dynamic warm up is a controlled moderate to high intensity sport specific movement-based exercise through participant’s range of motion

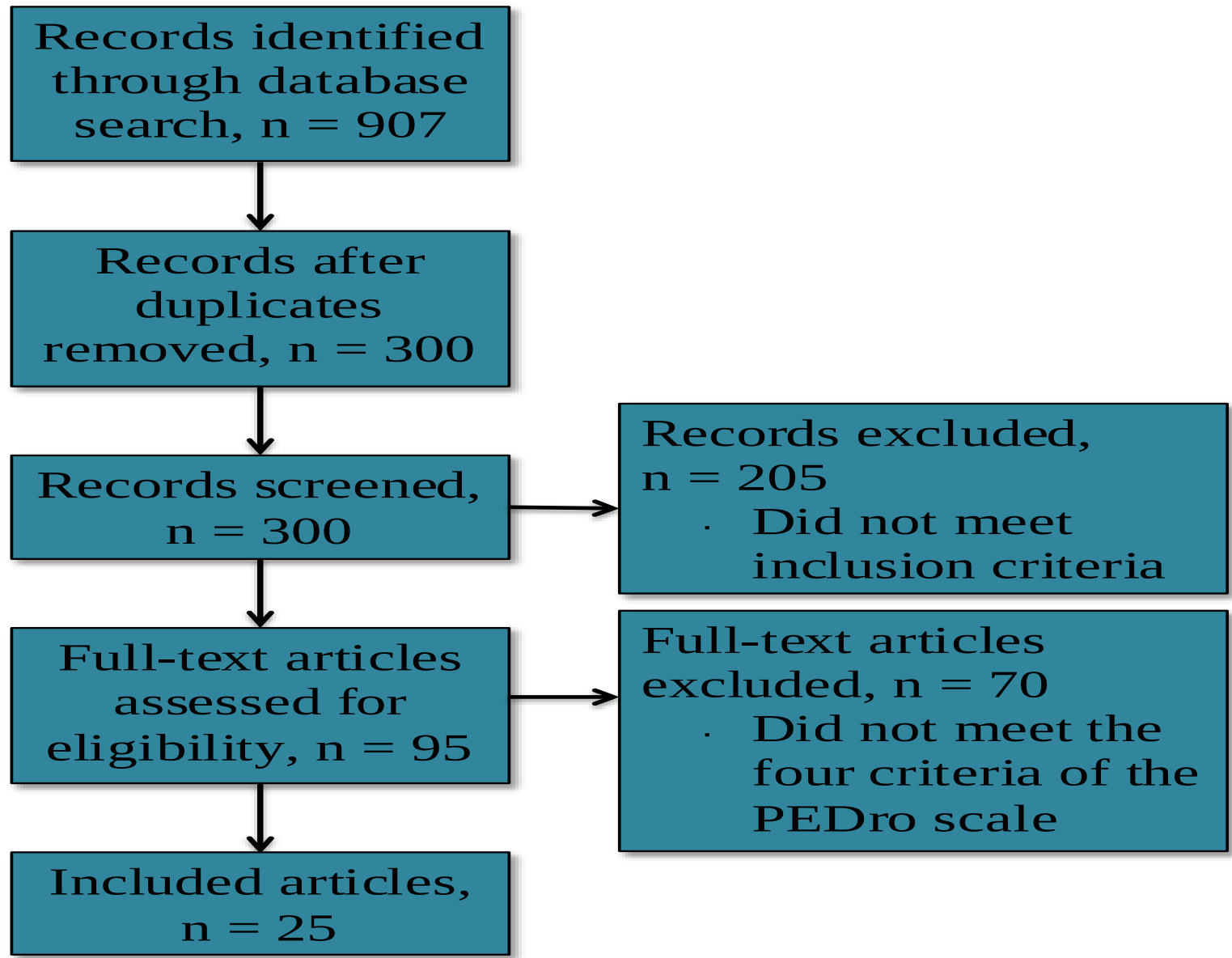
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Bishop and Middleton (2013)	=	=	=	=	=	=
Bryne et al (2014)						+
Chaouachi et al (2010)	=	=	=	=	=	=
Curry et al (2009)			=	=		
Dalrymple et al (2009)			=	=		
Faigenbaum et al (2006)			-	+	=	=
Fletcher and Jones (2004)					-	+
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Gunsoo et al (2011)					=	+
Herman and Smith (2008)	=	+				
Kistler et al (2010)					=	=
Morrin and Redding (2013)			-	+		
Murphy et al (2010)			=	=		
Needham et al (2009)			-	+	-	+
Pagaduan et al (2012)			-	+		
Paradisis et al (2014)			-	-	-	=
Ryan et al (2014)			=	+		
Samson et al (2012)					(=) / +	(=) / +
Siatras et al (2003)					-	=
Turki et al (2011)			=	+		
Turki-Belkhiria (2014)			+	+	(=) / -	+
Total	0 (+), 1 (-), 4 (=)	3 (+), 0 (-), 2 (=)	1 (+), 7 (-), 7 (=)	10 (+), 1 (-), 6 (=)	1 (+), 7 (-), 7 (=)	8 (+), 0 (-), 7 (=)
Detailed assessment of outcome measures with static stretching and/or dynamic stretching. (+): Positive effect, (-): Negative effect, (=): No significant difference Alternate Forms: (N.S.) No Stretching, (B.S.) Ballistic Stretching, (S.S.) Static Stretching						

Terms Searched in Electronic Databases

	CINAHL	PubMed	SPORTDiscus	PEDro	CINAHL (Medline, SPORTDiscus, & CINAHL)	TOTAL
Dynamic Warm Up	30	38	73	0	140	281
Dynamic Stretching	52	80	160	17	291	600
Dynamic Warm Up AND Dynamic Stretching	3	5	5	0	13	26
TOTAL	85	123	238	17	444	907

Results

Although there is conflicting evidence showing a dynamic warm up protocol improves one’s jump height, speed and agility, studies found that a dynamic warm up protocol does not negatively affect one’s performance.

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