Psychology of Sport & Exercise xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Psychology of Sport & Exercise

journal homepage: www.elsevier.com/locate/psychsport

Redressing the balance: Commentary on "Examining motor learning in older adults using analogy instruction" by Tse, Wong, and Masters (2017)

Ray Bobrownicki[a,*], Dave Collins[b], John Sproule[c], Alan C. MacPherson[c]

[a] School of Science and Sport, University of the West of Scotland, Almada Street, Hamilton, ML3 0JB, United Kingdom
[b] Institute of Coaching and Performance, University of Central Lancashire, Preston, Lancashire, PR21 2HE, United Kingdom
[c] Institute for Sport, Physical Education and Health Sciences, University of Edinburgh, St. Leonard's Land, Holyrood Road, Edinburgh, EH8 8AQ, United Kingdom

ARTICLE INFO

Keywords:
Motor learning
Instruction
Explicit instruction
Analogy
Coaching

ABSTRACT

Tse, Wong, and Masters (2017) recently published a study that indicated that analogy instruction may help older adults acquire resilient motor skills that require reduced cognitive processing compared to traditional explicit instruction. Although we do not dispute that analogy learning may prove useful for this population, in this commentary, we contend that there are methodological issues in this research—which are shared with previous studies comparing analogy and explicit instruction—that potentially limit ecological validity, impact the size of detected effects, influence the development and understanding of associated theory, and, as such, constrain resulting recommendations for applied practice. Of particular concern is the comparison of the *single*-item analogy instruction to the list of *nine* explicit instructions, which risks conflating the effects of the *type* of instruction with the *volume* of instruction. We further argue that the benefits of analogy may be more parsimoniously explained by the instruction's capability to succinctly convey skill (rather than its potential for limiting reinvestment), but that this capability may only be realised if the to-be-learned analogy is relevant and readily understood by the learner. Finally, we suggest that research in this area must look to incorporate more rigorous methods that compare experimental conditions to representative reference groups that allow us to explore how and when to deploy the myriad instructional tools available to practitioners and learners.

In a recent study, Tse, Wong, and Masters (2017) investigated the efficacy of analogy instruction in motor learning for older adults. The authors suggested that older adults may benefit from analogy instructions, as the analogy learners demonstrated more robust performance under pressure and reported fewer verbal rules than their explicit-learning counterparts. These findings clearly correspond with previous research with young adults (e.g., Lam, Maxwell, & Masters, 2009a, 2009b; Liao & Masters, 2001) and, more recently, with adolescents (Tse, Fong, Wong, and Masters, 2017). We are concerned, however, that limitations in the study by Tse, Wong et al. (2017), which notably reflect consistent and prevalent issues in the associated literature, continue to skew the debate concerning analogies and explicit instructions, making it more difficult for applied practitioners to equitably evaluate the available instructional tools. This commentary sets forth these issues and presents suggestions for future research in this area.

1. Quantity and quality of instructions may confound the control condition and misrepresent practice

As shown in Table 1, explicit instructions have traditionally outnumbered analogy instructions throughout the literature by margins that misrepresent real-world settings (Bobrownicki, MacPherson, Coleman, Collins, & Sproule, 2015). In their recent study, Tse, Wong et al. (2017) have continued to follow this customary, but arguably unrepresentative, research paradigm by comparing a *single* analogy to *nine* explicit instructions. According to Lam et al. (2009b), in studies such as this, a "fairer comparison might be achieved" (p. 189) by matching the number of rules for these instruction types. Indeed, Bobrownicki et al. (2015) stressed that research in analogy and explicit instruction should aim to avoid these disparate instructional protocols, because these informational imbalances create questionable reference groups, present issues with working memory capacity, and conflict with recommended coaching practice (e.g., Mannie, 1998; McQuade, 2003; Schmidt & Wrisberg, 2004; UK Athletics, 2009), serving to limit the relevance and generalisability of any findings. Unfortunately, only a few studies to this point have looked to implement such controls on instructional quantity (Bobrownicki et al., 2015; Schücker, Ebbing, & Hagemann, 2010; Tse, Fong et al., 2017). Although Tse, Wong et al. (2017) acknowledged this issue concerning the number of instructions toward the end of the discussion section, the instructional imbalance

* Corresponding author.
E-mail address: ray.bobrownicki@uws.ac.uk (R. Bobrownicki).

https://doi.org/10.1016/j.psychsport.2018.05.014
Received 28 November 2017; Received in revised form 20 April 2018; Accepted 25 May 2018

Table 1
Comparison of studies in sport and exercise investigating differences between analogy and explicit instructions.

Study	Task	Pressure manipulation	Measures	Conditions	Number of rules	Number of words
Tse, Wong et al. (2017)	Table tennis topspin forehand	Backwards counting	Target accuracy	Young analogy (n = 18)	1	14
				Old analogy (n = 17)	9	78
				Young explicit (n = 18)	1	14
				Old explicit (n = 17)	9	78
Tse, Fong et al. (2017)	Rope skipping for adolescents	Backwards counting	Successful skips	Analogy (n = 15)	11	104[a]
			Technique (rated)	Explicit (n = 17)	11	113[a]
Bobrownicki et al. (2015)	High jumping	Rising high-jump bar	Highest height cleared	Analogy (n = 7)	2	20
			Technical efficiency	Explicit light (n = 7)	3	20
			Joint angle variability	Traditional explicit (n = 7)	8	96
Schücker, Hagemann, and Strauss (2013)	Golf putting	Tone judgement Prize money Peer comparison	Putt accuracy	Analogy (n = 20)	1	6[b,c]
				Explicit (n = 21)	6	86[c]
Schlapkohl, Hohmann, and Raab (2012)	Study 1: Table tennis forehand	Decision making	Target accuracy	Analogy (n = 24)	1	11
			Movement pattern	Explicit (n = 22)	5	88
				Control (n = 10)	0	0
	Study 2: Table tennis forehand	Decision making	Target accuracy	Analogy (n = 20)	1	11
			Movement pattern	Explicit (n = 20)	5	88
				Control (n = 10)	0	0
	Study 3: Table tennis					
	Undercut stroke	Decision making	Target accuracy	Discus analogy (n = 8)	1	10
			Movement pattern	Explicit (n = 7)	5	83
	Counter hit	Decision making	Target accuracy	Soldier analogy (n = 8)	1	14
			Movement pattern	Explicit (n = 7)	5	88
	Topspin forehand	Decision making	Target accuracy	Stroke analogy (n = 8)	1	16
			Movement pattern	Explicit (n = 7)	5	82
Koedijker, Poolton, Maxwell, Oudejans, Beek, and Masters (2011)	Table tennis topspin forehand	n/a	Target accuracy	Analogy (n = 14)	1	14
				Explicit (n = 15)	5	46
Schücker et al. (2010)	Golf swing	Tone judgement	Drive distance	Analogy (n = 28)	30	n/a
			Drive deviation from centre	Explicit (n = 23)	30	n/a
Hu and Xu (2009)	Table tennis topspin forehand	n/a	Target accuracy scores	Analogy (n = 11)	1	n/a[d]
				Explicit (n = 11)	8	n/a[d]
Lam et al. (2009a)	Seated basketball shooting	Expert evaluation	Shooting performance	Analogy (n = 12)	1	17
			Probe reaction times	Explicit (n = 12)	8	81
Lam et al. (2009b)	Seated basketball shooting	Backwards counting	Shooting performance (rated)	Analogy (n = 9)	1	19
			Arm kinematics	Explicit (n = 9)	8	78
				Control (n = 9)	0	0
Koedijker, Oudejans, and Beek (2007)	Table tennis topspin forehand	Prize money Backwards counting	Target accuracy	Analogy	2	≈33[e]
			Movement quality (rated)	Explicit	14	88[e]
				Environmental focus	2	n/a
				Movement focus	1	≈4[e]
Poolton et al. (2007)	Table tennis topspin forehand	Backwards counting	Target accuracy	Analogy (n = 14)	1	n/a[d]
				Explicit (n = 14)	6	n/a[d]
Poolton, Masters, and Maxwell (2006)	Table tennis topspin forehand	Decision making	Target accuracy	Analogy (n = 15)	1	14
				Explicit (n = 18)	6	53
Law, Masters, Bray, Eves, and Bardswell (2003)	Table tennis topspin forehand	Audience observation	Target accuracy	Analogy (n = 14)	1	
				Explicit (n = 14)	6	
Liao and Masters (2001)	Table tennis topspin forehand	Backwards counting	Target accuracy	Analogy (n = 10)	2	≈29[b,e]
				Explicit (n = 10)	12	n/a[b,e]
				Implicit (n = 10)	0	0[b]

[a] Study protocols integrated with skill instructions.
[b] Participants also received additional visual demonstrations or verbal instructions.
[c] Participants also received pictures demonstrating technique.
[d] Instruction provided in Chinese.
[e] Exact wordings of instructional groups not provided.

required greater attention given the previous criticisms, the limited ecological validity, and the implications for applied practice. As many of the same authors (Tse, Fong et al., 2017) have previously acknowledged that real-world instruction is ordinarily provided in a step-by-step manner (i.e., one or two instructions at a time) rather than many instructions all at once, it is not necessarily clear why this apparent imbalance continues to persist in the analogy and explicit instruction literature.

In addition to issues of *quantity*, however, there are also concerns regarding the *quality* of the explicit instructions in the study of Tse, Wong et al. (2017), as explicit learners were provided specific movement information that possessed limited correspondence to the analogy instruction and the aims of the task. For example, the explicit rules to position feet 'side on at 45° to the table' and to rotate 'hips, waist, and shoulders forward when *serving*' provided excess information that was neither conveyed in the single analogy instruction to 'move the racket such that it is travelling up the side of a mountain' nor pertinent to the top-spin forehand *return* task, which did not include any service (balls were delivered to participants in the return task by machine). As research has indicated that analogies may be differentially effective and