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Rapid Weight Loss Practices among Elite Combat Sports Athletes in Malaysia

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ABSTRACT

Introduction: This study aimed to (i) determine rapid weight loss (RWL) practices among Malaysian elite combat sports athletes and (ii) examine the relationship between the characteristics of athletes, self-reported history of weight loss, perceived influence on weight loss and RWL practices. **Methods:** This was a cross-sectional study conducted at the Malaysian National Sports Institute among elite combat sports athletes (n=40) recruited via a convenience sampling method. The athletes completed a self-administered validated Rapid Weight Loss Questionnaire. Each response was provided a score and the total RWL score corresponded to the aggressiveness of weight management methods. Partial correlations were used to assess the relationships between total RWL score and independent variables. **Results:** The prevalence of RWL among the athletes was high (92.5%). Training with rubber or plastic suits (62.2%) and meal-skipping (27.0%) were the most common RWL techniques practised by the respondents. Aggressive weight-cutting as depicted by a higher total RWL score that correlated with most weight ever lost, duration taken to lose weight, influence of training colleagues and coaches, BMI, current weight and post-competition weight regain (all $p<0.05$). In contrast, negative correlations were seen between total RWL score, and the age at which the athletes began competing ($p<0.001$), duration of competition ($p<0.001$), age at first participation ($p<0.05$), duration of participation ($p<0.05$) and influence of nutritionists on weight loss ($p<0.05$). **Conclusion:** A high prevalence of aggressive weight loss among elite combat sports athletes and its association with perceived influence of sports professionals, colleagues and actual weight-related characteristics are of great concern.

Key words: Combat sports, elite athletes, rapid weight loss, weight management

INTRODUCTION

Weight classifications ensure equitable competition in strength, agility and strength (Artioli *et al.*, 2010a). While the intention is noble, the pressure to perform has resulted in cultivation of an undesirable practice – rapid weight loss (RWL). RWL, which is also analogous to weight-cutting, weight cycling and rapid body mass loss, is one of the most commonly used strategies by athletes in combat sports to gain a winning edge in their targeted weight classes. Petterson, Ekstrom & Berg (2013) proposed that RWL may have more mentally important functions beyond the common notion of gaining physical advantage over opponents, and is seen as a vital preparatory and coping strategy that increases the combat athletes' focus and commitment. Since the 1970s, athletes have been known to partake in a number

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of aggressive weight loss methods such as severe restriction of food and fluid intake, vigorous exercising, utilisation of rubber and plastic suits, saunas, consumption of diet pills, diuretics or laxatives and vomiting, to lose up to 10% of their body weight in order to qualify in a lighter weight class (Artioli *et al.,* 2010a; Artioli *et al.,* 2010b; Sundgot-Borgen & Garthe, 2011; Turocy *et al.,* 2011). The danger lies in sports with less weight classes which forces athletes to practise extreme weight loss behaviours to compete in lower weight categories or to have an upper hand (Artioli *et al.,* 2010b).

This unsafe weight loss practice poses a threat to the performance of athletes and affects their health. RWL affects metabolism and muscle contraction pattern, which are associated with increased risk of injuries. At the very least, there are significant health risks that can result due to the aggressive and extreme methods of RWL, which include low nutritional status, impaired physical performance, growth and development (Berkovich *et al.,* 2016). The cyclical process of weight gain and loss in a season for regular participants is also an issue of great concern as it has side effects such as dehydration, impacts cognitive and psychological function, increases stress, impairs immune system and results in metabolic changes (Artioli *et al.,* 2010a; Artioli *et al.,* 2010c; Sundgot-Borgen & Garthe, 2011). Matthews & Nicholas (2016) in their paper, have also cautioned that harmful dehydration-based RWL approaches seen in their study to be comparable to strategies that have previously resulted in mortality. In addition, extreme cases of RWL have led to deaths due to dehydration and hyperthermia and myocardial infarction (Artioli *et al.,* 2010b; Sundgot-Borgen & Garthe, 2011). The danger of RWL has been recognised by sports bodies and position statements have been issued to reflect their stand (Oppliger *et al.,* 1996; Turocy *et al.,* 2011). Citing the World Anti-Doping Agency Code's prohibited method criteria, Artioli *et al*. (2016) even recommended that RWL practices be banned from combat sports.

The available evidence on RWL among Malaysian athletes is limited. Hence, there is a need to determine the prevailing methods of RWL preferred by athletes to serve as a cornerstone for future studies into its impact on the performance of the elite athletes. This study will be useful for the combat sport athletes to understand their patterns of weight loss as well as allow the coaches to be aware of the weight loss methods used by the athletes and give necessary recommendations tailored to each athlete.

METHODS

Study location and participants

Elite combat sport athletes (n=40) from the National Sports Institute (ISN), which is based in Kuala Lumpur, Malaysia, participated in this study. Permission and ethics approval to conduct this study were obtained from ISN Research Committee (ISNRP: 23/2-13(6)) and Monash University Human Research Ethics Committee (CF13/3445 – 2013001773).

Convenience sampling method was used to recruit the study respondents. The pool of respondents included karate (n=15), boxing (n=10) and taekwondo (n=15) athletes. Elite combat sport athletes aged at least 16 years and who were training with ISN at the time of recruitment were eligible to participate in this study. The potential respondents were approached prior to their training sessions and were given the explanatory statement, along with a verbal explanation of the study by the investigators. Athletes who fulfilled the eligibility criteria and provided written informed consent were recruited into the study. Coaches were also present when informed consent was obtained from athletes below the age of 18 years. The

athletes were then requested to complete a self-administered questionnaire. Anonymity was maintained throughout the study period.

Study questionnaire

The study questionnaire consisted of three sections: demographics of athletes, weight loss history and the Rapid Weight Loss Questionnaire (RWLQ), a validated tool that had been previously used to assess the RWL pattern in judo exponents in Brazil (Artioli *et al.,* 2010a). RWLQ consisted of 18 items. Each item in the RWLQ was assigned a score if the response fulfilled the requirement. Three points will be awarded if participants had lost weight in order to compete, while 0.5 points will be assigned for each weight loss in the most weight loss section. One point will be given every time the participant loses weight to compete. Average amount of weight lost will have one point assigned for each kg lost. The shorter the period of weight loss, the higher the points assigned with a maximum of five points and minimum of zero point according to a range of 1 day to 15 days or more. Age began weight loss was also given a maximum of five points and minimum of zero points according to the age participants started weight loss practices. One point will be allocated for each kg regained thereafter. Undesired weight loss practices will be given a score of 3, 2, 1, 0.5 and 1 if participant responded as "always", "sometimes", "almost never", "I don't use anymore" and "never used" respectively. The score obtained from RWLQ corresponds to aggressiveness of the weight management behaviour. A higher total score indicates more aggressive practice of undesirable methods of weight loss and higher exposure to the risk of RWL.

The study questionnaire was back-translated into Bahasa Malaysia, the national language of Malaysia by native speakers. The content validity was determined by a group of experts consisting of sports nutritionists, sports physicians, coaches and ISN representatives. When the experts were satisfied, the questionnaire was pre-tested on a group of elite combat sports athletes (n=10) to determine its face validity. The final questionnaire was used in subsequent data collection.

Statistical analysis

The study respondents' characteristics, self-reported weight loss history and perceived influence of other individuals on their weight management behaviour were analysed using means, standard deviations, ranges, frequencies and percentages. Partial correlations were used to determine the relationships between total RWL score, weight status, involvement in competitive sports, weight change patterns and perceived influence of others on weight management behaviour. Statistical analyses were performed with IBM® SPSS®Statistics 23.0 and statistical significance was set at $p<0.05$.

RESULTS

The prevalence of self-reported RWL among combat sports athletes in the ISN was 92.5%, which means that 37 out of the 40 interviewed self-reported practicing RWL. The majority of the athletes (65%) were males with ages ranging from 16 to 31 years (Table 1). On average, the athletes began participating in combat sports before turning 11 years old and had been participating competitively before they reached the age of 13 years. Their current mean weight (62.17$\pm$10.19 kg) was almost similar to the previous off-season weight (63.06$\pm$10.26 kg). However, the average most weight ever lost was more than 5kg, accounting for an almost 5% of their body weight. The athletes began to resort to weight-cutting as early as 9 years old, with a mean age of 15.92$\pm$3.03 years. The athletes were engaged in weight loss practices that took a short duration of time (1 to 30 days) and they had more than

Table 1. Characteristics and self-reported weight loss history of the study respondents

	Mean+SD	*Min-Max*
Characteristics		
Age (years)	21.0 ± 3.8	16 – 31
Weight (kg)	62.2 ± 10.2	46.6 – 83.0
BMI (kg/m^2)	21.5 ± 2.4	17.0 – 27.1
Age began participating (years)	10.7 ± 4.4	3 – 24
Age began competing (years)	12.8 ± 3.9	6 – 24
Duration of participation (years)	10.4 ± 4.9	2 – 24
Duration of competition (years)	8.3 ± 3.6	2 – 16
Current weight class of participation (kg)	61.1 ± 10.8	46 – 84
Off-season weight (kg)	63.1 ± 10.3	45.60 – 86.00
Self-reported weight loss history		
Age began weight cutting (years)	15.9 ± 3.0	9 – 21
Most weight ever lost (kg)	5.1 ± 3.9	1.0 – 23.0
Most weight ever lost (%)	8.0 ± 4.7	1.6 – 27.7
Average weight usually lost (kg)	2.9 ± 1.4	0.5 – 6.0
Average weight usually lost (%)	4.7 ± 2.3	1.0 – 10.2
Duration taken to lose weight (days)	11.9 ± 9.6	1 – 30
Frequency of weight reductions in the last year	2.2 ± 1.6	0 – 6
Post-competition weight regain (kg)	2.4 ± 1.1	1.0 – 5.00
Total RWL score[a]	34.7 ± 7.3	22.5 – 54.5

[a] Calculated using Rapid Weight Loss Questionnaire (RWLQ)

two episodes of weight reductions in the previous year. Training with rubber or plastic suits was rated high with more than 62% of the respondents reporting to always using this method to lose weight, and this proportion was higher than gradual weight loss methods (Table 2). Gradual dieting and increased exercise techniques came next, followed by skipping meals and restriction of fluids.

The total RWL score had a moderate negative correlation with age the athletes began competing (r=-0.668, p<0.001) and duration they had been actively competing (r=-0.644, p<0.001), and a weak negative correlation with age they began participating in combat sports (r=-0.338, p<0.05), duration since they began participating in combat sports (r=-0.485, p<0.05) and perceived influence of nutritionists on their weight loss (r=-0.370, p<0.05) (Table 3). In contrast, total RWL score was found to have a moderate positive correlation with most weight ever lost (r=0.552), duration taken to lose weight (r=0.589), perceived influence of their training colleagues (r=0.483) and coaches (r=0.417) on their weight management behaviour, as well as a weak positive correlation with BMI (r=0.385), current weight (r=0.383), and post-competition weight regained within a week (r=0.335) (all p<0.05). Most weight lost by the athletes moderately correlated with current weight (r=0.566, p<0.05).

Athletes' weight management behaviour was highly influenced by their coaches (62.2%), followed by nutritionists or dieticians (35.1%) and training colleagues (27.0%). Surprisingly more than 50% of the respondents did not perceive their doctors or physicians as having any influence on their weight management behaviour (Figure 1). Perceived influence of these individuals

Table 2. Frequency analysis of weight loss methods reported by the athletes

Type of method weight loss		*Always (%)*	*Sometimes (%)*	*Almost never (%)*	*Never (%)*	*Do not use anymore (%)*
Gradual						
	Increased exercise	37.8	37.8	24.3	0	0
	Gradual dieting	32.4	43.2	16.2	5.4	2.7
RWL[a]						
	Training with rubber / plastic suits	62.2	45.9	21.6	62.2	8.1
	Skipping meals	27.0	40.5	21.6	10.8	0
	Restricting fluids	10.8	43.2	27.0	13.5	5.4
	Heated training rooms	8.1	48.6	27.0	16.2	0
	Sauna	8.1	35.1	40.5	10.8	5.4
	Fasting	5.4	18.9	29.7	40.5	5.4
	Spitting	5.4	16.2	35.1	32.4	10.8
	Laxatives	2.7	21.6	29.7	29.7	16.2
	Diet pills	2.7	13.5	27.0	45.9	10.8
	Diuretics	0	18.9	37.8	32.4	10.8
	Vomiting	0	5.4	18.9	62.2	13.5

[a]Rapid weight loss

on the self-reported history of weight loss can be seen with the correlations (Table 3). The perceived influence of coaches and nutritionists was inversely associated with the age of active competition as the athletes were only assigned to these professionals once they began actively competing, which usually occurs at a later age. The influence of coaches (r=0.555, p<0.05) and nutritionists (r=0.588, p<0.05) became apparent as the athletes spend more time in competition. There were negative correlations between age they began to cut weight and influence of coaches (r=-0.585), personal trainers (r=-0.532), doctors (r=-0.484) and parents (r=-0.346) (all p<0.05). In addition, most weight ever lost was correlated with perceived influence of coaches (r=0.660,p<0.001), personal trainers (r=0.375, p<0.05) and training colleagues (r=0.301, p<0.05). Interestingly, duration taken to lose weight was positively correlated with influence of the nutritionists (r=0.456, p<0.05), but negatively correlated with influence of training colleagues (r=-0.322, p<0.05). The post-competition weight regain was significantly correlated with influence of training colleagues on weight loss (r=0.345, p<0.05), while negatively correlated with influence of the professionals: nutritionists (r=-0.384), coaches (r=-0.384), doctors (r=-0.344) and personal trainers (r=-0.293) (all p<0.05).

DISCUSSION

To the best of our knowledge, this is the first study that explored RWL among combat sports athletes in Malaysia. The prevalence of RWL in this study group (92.5%) was higher compared to previous studies among Taekwondo exponents (75.6-88.6%) (da Silva Santos *et al.*,2016), judo competitors (52.2-80.0%) (Berkovich *et al.*,2016; Escobar-Molina *et al.*,2015; Artioli *et al.*, 2010c) and wrestlers (79.5%) (Oppliger, Steen & Scott, 2003). At 4.7% percentage of average body weight loss, it is within the usual range of weight lost due to RWL strategies (2.5%-5%) as reported in the literature (Alderman *et al.*, 2004;

Table 3. Partial correlation between the characteristics of respondents, self-reported history of weight loss, perceived influence on weight loss and total RWL score

	Total RWL score	Weight	BMI	Age (participation)	Age (competition)	Duration of participation	Duration of competition	Age beginning weight cutting	Most weight ever lost	Duration taken to lose weight	Post-competition weight regain	Doctor	Personal trainer	Coach	Nutritionist	Training colleague	Parents
Total RWL score	1.000																
Weight	0.383*	1.000															
BMI	0.385*	0.835**	1.000														
Age began participating	-0.338*	-0.158	-0.057	1.000													
Age began competing	-0.668**	-0.011	0.245	0.648**	1.000												
Duration of participation	-0.485*	0.017	0.098	-0.899**	-0.745**	1.000											
Duration of competition	-0.644**	0.058	0.045	-0.865**	-0.887**	-0.875**	1.000										
Age beginning weight cutting	-0.167	0.257	0.052	0.354*	0.665**	-0.369*	-0.688**	1.000									
Most weight ever lost	0.552*	0.566*	0.298	-0.142	-0.144	0.201	0.192	0.018	1.000								
Duration taken to lose weight	0.589*	0.340*	0.112	-0.015	-0.100	0.147	0.111	0.145	-0.545*	1.000							

	Total RWL score	Weight	BMI	Age (participation)	Age (competition)	Duration of participation	Duration of competition	Age beginning weight cutting	Most weight ever lost	Duration taken to lose weight	Post competition weight regain	Doctor	Personal trainer	Coach	Nutritionist	Training colleague	Parents
Post-competition weight regain	0.335*	0.176	0.139	0.079	-0.011	0.121	0.103	0.083	0.130	0.457*	1.000						
Doctor Total RWL score	-0.225	-0.134	-0.058	0.068	-0.032	0.074	0.045	-0.484*	-0.101	-0.155	0.127	1.000					
Personal trainer	-0.144	0.187	0.093	-0.099	-0.175	0.144	0.147	-0.532*	0.375*	0.222	-0.293*	0.185	1.000				
Coach	0.417*	-0.217	-0.065	-0.211	-0.456*	0.198	0.555*	-0.585*	0.660**	0.200	-0.344*	0.101	0.064	1.000			
Nutritionist	-0.370*	-0.152	-0.101	-0.151	-0.449*	0.177	0.588*	-0.005	-0.027	0.456*	-0.384*	0.091	0.326	0.062	1.000		
Training colleague	0.483*	0.198	0.156	-0.053	-0.157	0.222	0.298*	-0.202	0.301*	-0.322*	0.345*	0.027	0.094	0.241	0.084	1.000	
Parents	0.117	0.148	0.172	0.143	-0.069	0.104	0.075	-0.346*	0.115	0.140	0.057	0.043	0.014	0.005	0.092	0.120	1.000

Data is controlled for current age and gender
*significant at $p<0.05$
**significant at $p<0.001$

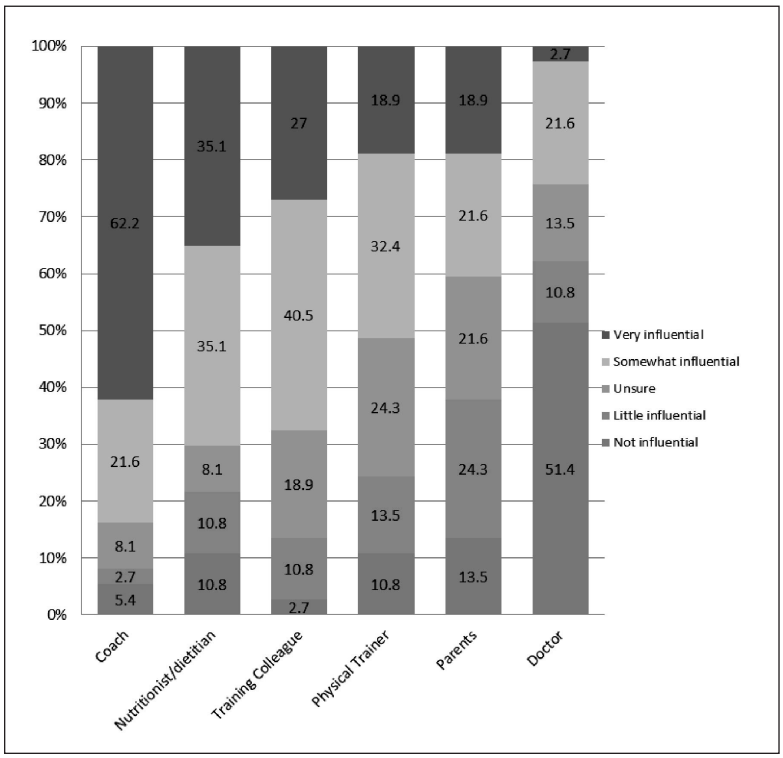

Figure 1. Perceived influential individuals on weight management behaviour of the athletes

Artioli *et al.,* 2010c; da Silva Santos *et al.,* 2016). However, the frequency of weight reductions is practised in the previous year in this study was lower when compared to Brazilian judo competitors (twice vs thrice a year), though Malaysian combat athletes took longer to lose the weight (12 days vs 7 days)(Artioli *et al.,* 2010c). Malaysian combat athletes began weight-cutting at a much later age (~16 years) as compared with ~13 years in the previous study (Artioli *et al.,* 2010c).

Extreme methods used by the elite combat athletes to achieve RWL were similar to those that have been reported among mixed-martial-arts competitors (Matthews & Nicholas, 2016), taekwondo exponents (da Silva Santos *et al.,* 2016), judo competitors (Berkovich *et al.,* 2016; Artioli *et al.,* 2010c). We also found a higher prevalence of these extreme methods being employed by our athletes (laxatives = 54%, diet pills = 43.2%, diuretics = 56.7%, vomiting = 24.3%) compared to judo competitors (laxatives = ~20%, diuretics = ~16%, diet pills = ~7%, vomiting = ~6.5%) as reported by Artioli *et al.* (2010c).

Our study found that both the athletes' weight and BMI serve as important indicators of the possibility of the atheletes indulging in aggressive weight loss regimens. It can be hypothesised that those athletes with heavier weight or higher BMI were pressured to lose weight and resorted to more aggressive weight loss methods in order to reach their goals. In the current study, aggressive RWL strategy, depicted as higher total RWL positively correlated with several self-reported weight characteristics. Athletes with higher scores had higher post-competition weight regained within a week indicating poor weight management

strategies. Furthermore, athletes who had most weight loss albeit reaching their goals but are more likely to use more extreme methods to obtain the desired effect, are the athletes that are at most risk of RWL complications. Athletes who have been actively competing for a longer time and began their combat sports journey at an early age tend to be less aggressive when it comes to weight-cutting based on the negative correlation seen between age participating and total RWL score (Table 3). Studies by Artioli *et al.* (2010c) and Kiningham & Gorenflo (2001) identified an association between the age the athletes began weight cutting and more extreme weight loss practices, which was also observed in the current study. Although the authors discussed several hypotheses, none of the studies could provide a strong and reliable explanation on the association between extreme weight loss practices and athletes' age.

Among the perceived influential individuals on weight management behaviours of the athletes, coaches were rated to be the most influential people followed by nutritionists and training colleagues. Similar patterns of perceived influence were also seen in other combat sports athletes (Artioli *et al.*, 2010c; Oppliger *et al.*, 2003 and Kiningham & Gorenflo, 2001). Our study also found that perceived influence of coaches, personal trainers, doctors and parents was relatively stronger when the weight cut practice started at an earlier age. Meanwhile correlations suggest that while the impact of parents eventually diminishes as the athletes age, the influence of nutritionists and training colleagues on weight management remains important. For example, higher perceived influence of nutritionists on weight loss resulted in less aggressive RWL strategies and post-competition weight regained (Table 3). We postulate that this could be due the trust fostered between the nutritionists and athletes leading to better compliance and adherence to desired weight loss practices as designed by the nutritionists. The positive impact of nutritionists or dieticians trained in sports nutrition or professionals who have been formally trained on the weight management of these athletes cannot be side-lined, and it has even been included in crucial guidelines (Turocy *et al.*, 2011). We also observed the positive influence of coaches and training colleagues resulting in a higher RWL score. This phenomenon may be explained by the increased time spent with coaches and training colleagues during competitive seasons. Hence, it is also important to be aware of the bi-directional influence on the athletes, but a more detailed study needs to be done to prove the hypothesis.

The information gathered will be invaluable for sports nutritionists to identify athletes who are resorting to extreme methods of weight loss and educate them on a balanced combination of diet and exercise to achieve similar weight loss results.

Strengths of the study

This was a primary cross-sectional study looking into the current weight management behaviour of the country's elite combat athletes. As the information was obtained using a validated RWL questionnaire during the preparatory phase prior to a competition, it best represents the weight loss patterns of the athletes.

Limitations of the study

This is a single centre study with a small sample size. A larger sample and multi centre size would be able to represent more accurately the findings of the quantitative and qualitative data. Hence, one has to be wary when extrapolating the data. Also, the survey tool was unable to determine and provide a cut-off to indicate where the weight management behaviour is dangerous and may potentially cause harm.

CONCLUSION

While the practice of undesired weight loss methods among athletes has long been known, there is lack of local evidence with regard to this aspect. This study found a high prevalence of RWL among elite combat sports athletes in the country. In addition, the study also explored further the relationship between aggressive RWL and weight-related characteristics, as well as perceived influence of professionals on their choice of weight loss methods. It is of great concern that more aggressive regimes such as laxatives, diet pills, diuretics and vomiting were being practised by the athletes. In addition, current weight and BMI may serve as important indicators of the possible practice of aggressive RWL regimens among athletes. This finding could strengthen Artioli *et al.* (2016)'s recommendation on reinforcement of rules and regulation with regard to RWL strategies. Healthcare and sport professionals such as nutritionists, coaches and personal trainers were found to be influential in the athletes' weight loss practices. Hence, there is a need for a multidisciplinary weight management team to be established in order to provide the best personalised weight regimen for each athlete. In addition, parents and training colleagues were also found to have some level of influence over RWL practices and outcomes, and this cannot be ignored.

Parents and trainers managing combat sports athletes, as well as the athletes themselves must be educated and trained in proper weight management strategies. Further research on implications of undesired weight loss among the athletes may be of interest. We also suggest that future studies be carried out to investigate the factors that affect athletes in making weight loss-related decisions in order to develop an effective intervention program.

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Conflict of interest

The authors report no conflict of interest in this work.

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