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EDITORIAL

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Reports of the EASO physical activity working group: Diverse insights, evidence-based recommendations, and future perspectives

There is an inverse association between physical activity (PA, as assessed by self-report or PA monitoring devices) and BMI suggesting that people with overweight and obesity are less active.[1,2] When compared with their normal weight counterparts total energy expenditure (TEE as assessed by doubly labeled water) is increased in patients with obesity.[3] The between-group differences in TEE disappeared after suitable adjustments for body weight or fat free mass.[3] A high TEE (mainly due to the high body weight) and, thus, fat free mass may mask the relatively low PA in patients with obesity.[2] Since however the inter-individual variance in TEE did not show an association with the inter-individual variance of weight changes the apparent discrepancy between accelerometry- and TEE-data has been supposed to be explained by a non-linear association between PA and measured TEE; that is, the body may adapt to increased PA to "constraint" TEE below the level of TEE calculated by a factorial method.[4] This phenomenon provides an alternative idea to explain why PA is not as effective to maintain or reduce body weight as people feel it "should" be.

Irrespective of low PA as a possible cause of obesity, exercise training is an established treatment strategy for patients with overweight and obesity. The present report of the EASO Physical Activity Working Group provides both, an up-to-date evidence base on the impact of exercise training on the management of overweight and obesity as well as recommendations for daily practice based on this evidence. The EASO group of clinical and non-clinical obesity experts across Europe addressed seven research questions. The summary answers are based on systematic reviews (SSRs) and meta-analyses (MAs) of data published between 2010 and 2019. Search strategies, inclusion and exclusion criteria, data extraction and synthesis, quality assessment and assessment of publication bias are described in detail documenting systematic and very professional work. The authors investigated different outcome variables, for example, weight and body composition change, physical fitness, energy intake and appetite, cardiometabolic health, psychological and behavior-related variables. At the end, the EASO Physical Activity Working Group came out with a synthesis and 15 recommendations.[5] The synthesis of the EASO Physical Activity Working Group reached different levels of evidence (as any review and meta-analysis does) with the highest strength of evidence for the following conclusions[5]:

- Aerobic training reduces body weight in adults with overweight or obesity; this is independent of the duration of intervention. During a weight-loss diet aerobic training alone or combined with resistance training leads to an additional weight loss compared to diet only
- Aerobic training and high-intensity interval training (but not resistance training) reduce abdominal visceral and intrahepatic fat compared to controls without training.
- Aerobic, resistance, or high-intensity interval training improve insulin sensitivity in patients with overweight or obesity with or without type 2 diabetes.
- Exercise training reduces systolic and diastolic blood pressure compared to controls without training.
- When compared with no exercise training aerobic, resistance, combined aerobic plus resistance and high-intensity interval training interventions increase physical fitness while resistance training improves muscle strength.
- After bariatric surgery exercise training conducted improves cardiorespiratory fitness and muscle strength.

When compared to these statements based on strong evidence, 13 answers reached moderate evidence while in nine areas of research the evidence was considered as low only. Moderate and low evidence mainly related to research questions about energy intake/appetite as well as psychological outcome variables and the value of behavior change techniques.

The present evidence is in favor of regular and planned PA in patients with overweight and obesity. Thus, the practice guidelines aimed at improving cardiometabolic health as well as wellbeing by recommending exercise training programs to support weight and fat loss (including reductions in visceral and liver fat) at preserved lean body mass, weight maintenance after weight loss, improved physical fitness, eating behavior and quality of life. Besides "structured" physical activities, the authors concluded that patients with obesity should reach at

least a moderate level of "non structured" activities in their daily lives.[5]

Taken together, the authors of the EASO Physical Activity Working Group have done a great job, to provide the present evidence base. They are to be congratulated. Although some of their conclusions and recommendations seem to be already well known ("nothing new"), we consider these reports as a step forward.

SSRs are not only about the topic in question, it is also about our science and, thus, about ourselves as scientists. Doing SSRs and MAs, we are trying to improve the probability to reach the best of our knowledge and to end up with the best decision or recommendation based on that knowledge. The degree of probability gives us a "… feeling of certainty or uncertainty, of belief or doubt…,"[6] at the end there may appear an illusion of certainty and data, even when there is none. To live with this feeling it is worthwhile to be aware of some methodological and intellectual "caveats." This is not about being negative at all. To keep our authenticity as scientists and to the best of our knowledge, we should accept that even the best SSRs and MAs must be read with some reservations.

A first point of reflection refers to the heterogeneity of studies included into these SSRs and MAs, the partly limited power of individual studies, the variable number of participants (including healthy subjects with overweight and obesity as well as patients), the differences in the study protocols (including the considerable variance in durations), the interventions themselves, controlled or uncontrolled training protocols and the use of different outcome variables. Although the members of the EASO Physical Activity Working Group have tried to carefully address and take into account all these issues, at the end of the day some doubt may still remain.

During a day, activity-related energy expenditure is mostly about "non structured" activities, that is, non-exercise activity thermogenesis, NEAT.[7] This refers to in part trivial amounts of energy expended (e.g., for walking and talking, all activities in daily life, and even fidgeting) which may add up to more than 500 kcal/d in individual subjects. While NEAT is highly variable within and between days as well as between subjects, energy expenditure of "structured" activities resembling exercise activity thermogenesis (EAT) are defined with respect to increases and duration.[7] The energy costs of EAT can be assessed quantitatively. By contrast, NEAT is calculated from the difference between TEE and the sum of resting energy expenditure, diet-induced thermogenesis and EAT. Since NEAT may decrease with weight loss, this may impact energy balance and, thus, the different outcomes of exercise interventions to tackle obesity. Addressing the effects of an exercise intervention on energy balance, one has to address EAT and NEAT as well as their possible interactions.

The authors of these reports gave us their "Here's what we recommend and why." That is fine. One point to think about further is that all the present studies on exercise interventions in patients with overweight and obesity are about effectiveness (i.e., the effect of the intervention under daily life conditions) rather than about efficiency (the effect under ideal conditions which is considered as the "true" effect of an intervention). Today, besides short-term studies, which can be performed under supervision, adherence to an exercise intervention cannot be addressed quantitatively. It can be assumed that the variance in adherence impacts any outcome of any exercise intervention and, thus, adds to the variance of all the data and their synthesis as presented here. It is worthwhile to remember that patients with obesity undergoing a low-calorie diet experience a weight loss half of that predicted.[8] This has been mainly attributed to difficulties in patient's adherence to the diets. However, the variance in adherence to a weight loss diet can be assessed quantitatively using mathematical models addressing both, effectiveness and efficiency.[9–11] It is obvious that there is a need for similar mathematical models to address the variance in adherence to an exercise intervention. This point also refers to a limitation of all SSRs and MAs; that is, they are about the average and the "average of the averages." There is an inherent weakness in the average and its limits to describe the whole distribution (individuals in the group) and, thus, the variance of the effects. To approach the efficiency referring to both, the average and the 'best' effects (i.e., the effects obtained in patients likely to show the best adherence) may give some further insights.

As far as cardiometabolic outcomes in studies on management of obesity are concerned, it is still a matter of debate whether positive outcomes are due to the interventions themselves (i.e., diet, exercise, or diet + exercise), the negative energy balance per se or weight loss and changes in body composition, respectively. In addition, following a two-point protocol with measurements before and some weeks after an intervention only, addresses both, the effect of the intervention itself as well as the metabolic adaptation to it. Thus, the "true" effect of an intervention is masked by metabolic adaptation. To continue that thought, metabolism rather than cardiometabolic risk factors should be assessed as a suitable outcome of exercise interventions. If we take that view, there is need of more systematic studies on the metabolic effects of exercise treatment in patients with overweight and obesity following protocols with a narrower time frame should be investigated together with long-term effects.[12]

SSRs and MAs of a long list of studies bring us back to the quality of our research. The authors of the report of the EASO Physical Activity Working Group gave considerable attention to study quality. Fortunately, many 'high quality' studies were available to analyze for the topics of interest. However, study quality varied between the different papers of this supplement. For example, in studies on weight loss 8% of studies were considered as 'poor' quality. By contrast, in studies on different outcomes of cardiometabolic health the respective numbers were 43% for blood pressure, 50% for the biomarker of insulin resistance and 31% for liver fat. Even more disturbing, 81% of the studies on energy intake and appetite included in the analysis were ranked as "poor," while only 19% reached "fair" and "good" quality. Since all those "poor" studies had been published in peer-reviewed and IF-ranked journals before, the high percentage of "poor quality" studies also reflect the "poor" quality of our present culture in reviewing, editing and publishing papers. However, this would merit another review.

These thoughts lead us to a final concern and a hope. This is about the very promising conclusions of this series of papers. Many SSRs included in this supplement end up with a statement that the results need to be confirmed by further well-designed and more

robust trials to improve evidence-based knowledge and allow the definition of comprehensive guidelines for patients with overweight and obesity. This is not surprising at all since there will always be an argument for more research and for better data. However, this conclusion may also be considered as an "idiom" or wishful thinking unless a stringent protocol needed to improve the present evidence base is provided. To be honest we should not be blue-eyed and believe that it is likely that we will have better studies and, thus, a better data base within the next 10 years. The present (and also the future) "state of the art" reflects (and will reflect) the so-called freedom of research which is mistakenly equated with the freedom of researchers. The freedom of researchers ends up with more or less "uncontrolled" research activities which are influenced by different factors (including research money and funding). To improve the evidence base on the impact of PA and exercise training on overweight or obesity, we would need a coordinated and planned research activity within the next 10 years. Thus, at the end the authors of the present report of the EASO Physical Activity Working Group are asked to take the lead of coordinated and expedient European research activities on PA and exercise training as part of the management of overweight or obesity. To go on future research activities, it is worthwhile to keep in mind the statement of the former CDC director, Tom Frieden, who had said, "We do not study problems to write articles about them. We study problems to stop them."[13] Tom Frieden's idea is about solution-oriented research. To do so would be a great step forward in obesity research.

CONFLICT OF INTEREST

No conflict of interest statement.

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REFERENCES

1. Besson H, Ekelund U, Luan J, et al. Cross-sectional analysis of physical activity and obesity indicators in European participants of the EPIC-PANACEA study. *Int J Obes (Lond)*. 2009;33(4):497-506.
2. DeLany JP, Kelley DE, Hames KC, Jakicic JM, Goodpaster BH. High energy expenditure masks low physical activity in obesity. *Int J Obes (Lond)*. 2013;37(7):1006-1011.
3. Carneiro IP, Elliott SA, Siervo M, et al. Is obesity associated with altered energy expenditure? *Adv Nutr*. 2016;16:476-487.
4. Pontzer H, Durazo-Arvizo R, Dugas LR, Cooper RS, Schoeller DA. Constrained total energy expenditure and metabolic adaptation to physical activity in adult humans. *Curr Biol*. 2016;26(3):410-417.
5. Oppert J-M, Bellicha A, van Baak MA, et al. Exercise training in the management of overweight and obesity in adults: Synthesis of the evidence and recommendations from the European Association for the Study of Obesity Physical Activity Working Group. *Obes Rev*. 2021;22(Suppl 4):e13273. https://doi.org/10.1111/obr.13273
6. Popper K. *The Logic of Scientific Discovery*. Oxon, UK: Routledge Classics, Routledge, Abingdon-on Thames; 2002:P135.
7. Levine JA. Non exercise thermogenesis (NEAT). *Best Pract Res Clin Endocrinol Metab*. 2002;16(4):679-702.
8. Heymsfield SB, Harp JB, Reitman ML, et al. Why do obese patients not lose more weight when treated with low-calorie diets? A mechanistic perspective. *Am J Clin Nutr*. 2007;85(2):346-354.
9. Hall KD. Estimating human energy intake using mathematical models. *Am J Clin Nutr*. 2014;100(3):744-745.
10. Racette SB, Das SK, Bhapkar M, et al. Approaches quantifying energy intake and % calorie restriction during calorie restriction interventions in humans. The multicenter CALERIE study. *Am J Physiol Endocrinol Metab*. 2012;302:E441-E448.
11. Dorling JL, Das SK, Racette SB, et al. Changes in body weight, adherence, and appetite during 2 years of calorie restriction: the CALERIE 2 randomized clinical trial. *Eur J Clin Nutr*. 2020;74:1210-1220.
12. Müller MJ, Enderle J, Bosy-Westphal A. Changes in energy expenditure with weight gain and weight loss in humans. *Curr Obes Rep*. 2016;5(4):413-423.
13. Rubin R. US CDC celebrates 70 years. *Lancet*. 2016;388(10057):2224-2225.