Short report

β-Hydroxy-β-methylbutyrate (HMB) supplementation and resistance exercise significantly reduce abdominal adiposity in healthy elderly men


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A R T I C L E   I N F O

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A B S T R A C T

The effects of 12-weeks of HMB ingestion and resistance training (RT) on abdominal adiposity were examined in 48 men (66–78 yrs). All participants were randomly assigned to 1 of 4 groups: no-training placebo (NT-PL), HMB only (NT-HMB), RT with PL (RT-PL), or HMB with RT (RT-HMB). DXA was used to estimate abdominal fat mass (AFM) by placing the region of interest over the L1–L4 region of the spine. Outcomes were assessed by ANCOVA, with Bonferroni-corrected pairwise comparisons. Baseline AFM values were used as the covariate. The ANCOVA indicated a significant difference (p = 0.013) between group means for the adjusted posttest AFM values (mean (kg) ± SE: NT-PL = 2.59 ± 0.06; NT-HMB = 2.59 ± 0.61; RT-PL = 2.59 ± 0.62; RT-HMB = 2.34 ± 0.61). The pairwise comparisons indicated that AFM following the intervention period in the RT-HMB group was significantly less than NT-PL (p = 0.013), NT-HMB (p = 0.011), and RT-PL (p = 0.010). These data suggested that HMB in combination with 12 weeks of RT decreased AFM in elderly men.

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1. Introduction

Advancing age has been associated with increases in adipose tissue which generally accumulates in the central region of the body (O’Leary et al., 2006). The accumulation of abdominal fat mass (AFM) has been correlated with increased risk of cardiovascular disease, diabetes, hypertension, frailty and certain cancers (Hubbard et al., 2010; Lee et al., 2005; NIH, 1998). Development of interventions aimed at attenuating or reducing AFM across age is warranted. Exercise is thought to be effective in reducing AFM (O’Leary et al., 2006). The accumulation of abdominal fat mass (AFM) which generally accumulates in the central region of the body generally increases with age and is considered real (MD) from 10 men (65-75 yrs) 24-48 h apart for AFM were ICC = 0.98, SEM ± 0.09 kg, and MD = 0.25 kg.

Stout et al. (2013) was used in the analyses of the unpublished abdominal adiposity values. The study protocol was approved by the University Institutional Review Board and participants signed informed consent documents. Using a computer generated random allocation sequence, participants were assigned in a double-blind fashion to consume a placebo (200 mg calcium (Ca) + 4 g carbohydrate) or treatment powder (1.5 g CalHMB + 4 g carbohydrate) twice daily, ad libitum, for the 12 week resistance training (RT) intervention. Compliance was assured by recording individual product intake and measuring urinary HMB levels as described by Stout et al. (2013). Participants were further separated into no-training placebo (NT-PL), treatment only (NT-HMB), RT with PL (RT-PL), or treatment with RT (RT-HMB) groups. Supervised progressive RT sessions were performed three times per week for 12 weeks.

Abdominal adiposity was measured using the procedures described by Glickman et al. (2004). Whole-body scans were performed following a 12-hour fast using a dual-energy X-ray absorptiometry (DXA) scanner (Lunar Prodigy Advanced, Madison, WI, Software version 10.50.086). Post scan, a rectangular box was manually drawn around the L1–L4 region (abdomen) and DXA software provided AFM (kg) estimates. Previously determined intraclass correlation coefficients (ICC) and standard errors of measurement (SEM) and minimum difference needed to be considered real (MD) from 10 men (65–75 yrs) 24–48 h apart for AFM were ICC = 0.98, SEM ± 0.09 kg, and MD = 0.25 kg.

Data are reported in Table 1 as mean ± standard deviation (SD) for AFM. Analyses of covariance (ANCOVA) were used with pretest values serving as the covariate. In the event of a significant F ratio, post-hoc Bonferroni multiple comparisons were performed. Furthermore, follow-
Table 1
Unadjusted abdominal fat mass measures pre- to post-testing.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre (kg)</th>
<th>Post (kg)</th>
<th>Change (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NT-PL (n = 12)</td>
<td>2.26 ± 0.6</td>
<td>2.19 ± 0.6</td>
<td>0.07</td>
</tr>
<tr>
<td>NT-HMB (n = 12)</td>
<td>2.33 ± 0.7</td>
<td>2.36 ± 0.7</td>
<td>0.03</td>
</tr>
<tr>
<td>RT-PL (n = 12)</td>
<td>2.49 ± 0.8</td>
<td>2.5 ± 0.8</td>
<td>0.01</td>
</tr>
<tr>
<td>RT-HMB (n = 12)</td>
<td>2.45 ± 0.6</td>
<td>2.24 ± 0.6</td>
<td>&lt; 0.21</td>
</tr>
</tbody>
</table>

Values reported as mean ± standard deviation. NT no training, PL placebo, HMB calcium β-hydroxy-β-methylbutyrate, RT resistance training.

* Significant pre- to posttest p < 0.01.
* Significant difference from NT-PL, NT-HMB, RT-PL at post after adjustment for pre p < 0.05.

4. Discussion

These data suggest that supplementing HMB in combination with 12 weeks of resistance exercise decreased AFM in elderly men, while interventions consisting of only HMB supplementation or progressive RT were ineffective at reducing this potential health indicator. Furthermore, the corrected RT-HMB group mean difference in AFM was 0.25 kg, which met the minimum difference (MD = 0.25 kg) needed to be considered real based on our test–retest reliability when measuring AFM in men (Weir, 2005). In addition, the corrected group mean difference was sufficient to elicit a large effect size (0.22). Our data are consistent with previous studies that demonstrated total body fat loss when supplementing with HMB during RT for 12 to 24 weeks (Stout et al., 2013; Vukovich et al., 2001). The exact mechanism is unknown, however, Bruckbauer et al. (2012) suggested that HMB supplementation may improve metabolic capacity and fat utilization of myofibers. While HMB may improve the capacity to utilize fat, our data suggest that without exercise, no significant change in AFM occurred, whereas all subjects in the RT-HMB group resulted in a decrease (Fig. 1). In support, Vukovich et al. also demonstrated a significant decrease (−4.4%) in fat mass in the RT-HMB compared to RT only after 8 weeks of training in older men and women. Greater loss in abdominal adiposity observed in this study may be of particular interest due to the elevated comorbidities associated with excess visceral adipose tissue in older populations. Future studies are needed to further investigate the potential combination of resistance exercise and HMB supplementation for reducing AFM.

Acknowledgment

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References