The aim of this study was to determine what time is better, either before or after dinner, to perform resistance exercise (RE) to improve postprandial metabolic risk factors in obese type 2 diabetic patients. Methods: Thirteen obese type 2 diabetic patients completed three trials in a random order in which they consumed a standardized dinner meal with 1) no RE (NoRE), 2) pre-dinner RE (RE-M), and 3) post-dinner RE beginning 45 min after dinner (M-RE). During each trial blood samples were taken to measure glucose, triacylglycerol (TAG), acetaminophen (gastric emptying), endocrine responses, beta-cell function (mathematical modeling), and indirect calorimetry was used to measure substrate oxidation. Continuous glucose monitoring measured nocturnal and morning glycaemic control the next day. Results: The glucose iAUC was reduced (P<0.05) by ~18% and 30% during the RE-M and M-RE trials, respectfully, compared to NoRE, with no difference between RE trials. The total TAG iAUC was ~92% lower (P<0.05) during M-RE compared to NoRE and RE-M, an effect due to lower VLDL-1 TAG concentrations. RE-M and M-RE reduced the insulin iAUC by 35% and 48%, respectfully, compared to NoRE (P<0.05), but via different mechanisms as RE-M enhanced insulin clearance, whereas M-RE reduced insulin secretion and enhanced insulin clearance. The GLP-1 iAUC was ~49-50% lower (P<0.05) during M-RE compared to NoRE and RE-M. Gastric emptying, beta-cell function, substrate oxidation, GIP, and next day glycaemic control were not different between trials. Conclusions: Post-dinner RE improves postprandial risk factors better than pre-dinner RE in obese type 2 diabetic patients.