Supplementary results

A

	precision	recall	f1-score	support
0.0	0.97	1.00	0.98	88
1.0	1.00	0.57	0.73	7
accuracy			0.97	95
macro avg	0.98	0.79	0.86	95
weighted avg	0.97	0.97	0.96	95

B

	precision	recall	f1-score	support
0.0	0.92	0.74	0.82	31
1.0	0.68	0.84	0.75	32
2.0	0.87	0.81	0.84	32
accuracy			0.80	95
macro avg	0.82	0.80	0.80	95
weighted avg	0.82	0.80	0.80	95

FIGURE S1. Classification report for the random forest classifier on the binary classification task (**A**) and XGBoost on the multiclass classification task (**B**).

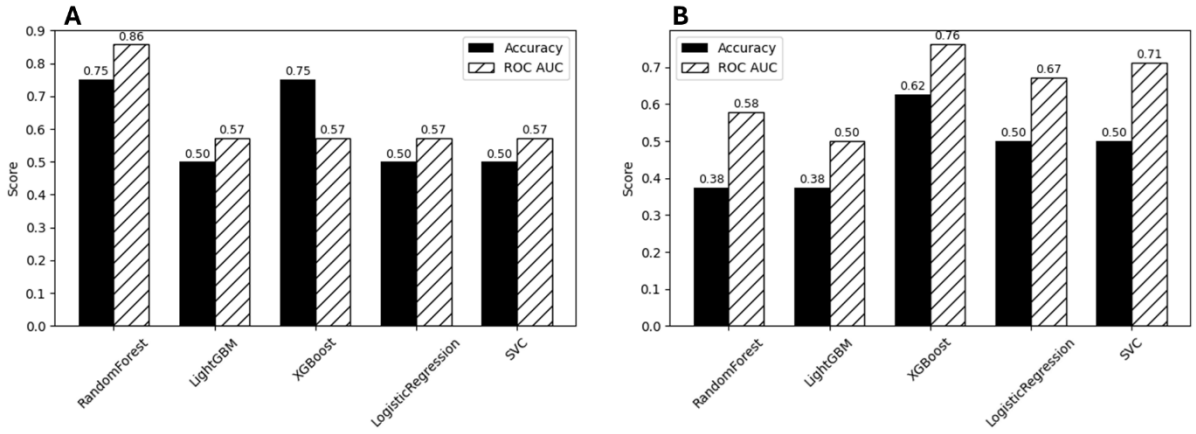


FIGURE S2. Scores reflecting the performances of 5 machine learning models in predicting adolescents' success rates in weight loss intervention, using a full database without imputation method.
Accuracy and ROC-AUC scores for each model for (**A**) binary classification (low success *vs*. high success) and (**B**) multiclass classification (low success *vs*. mild success *vs*. high success).
ROC-AUC: Area Under the Curve of the Reciever Operating Curve, RFC: Random Forest Classifier, LightGBM: Light Gradient Boosting Machine, XGBoost: Extreme Gradient Boosting Machine, LR: Logistic Regression, SVC: Support Vector Classifier.

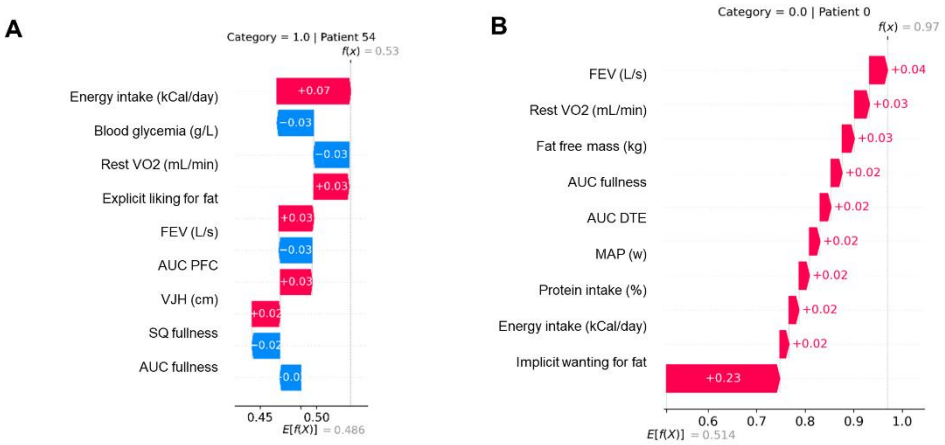


FIGURE S3. Example of individual SHAP waterfall plot for each category predicted by the binary Random Forest classifier.

Individual waterfall plot of SHAP values for a subject belonging (**A**) to the "low success" category (class=1.0) and (**B**) to the "high success" category (class=0.0). AUC: Area Under the Curve; DTE: Desire To Eat; FEV: Forced Expiratory Volume; MAP: Maximal Aerobic Power; PFC: Prospective Food Consumption; SQ: Satiety Quotient; VJH: Vertical Jump Height; VO2: oxygen consumption.

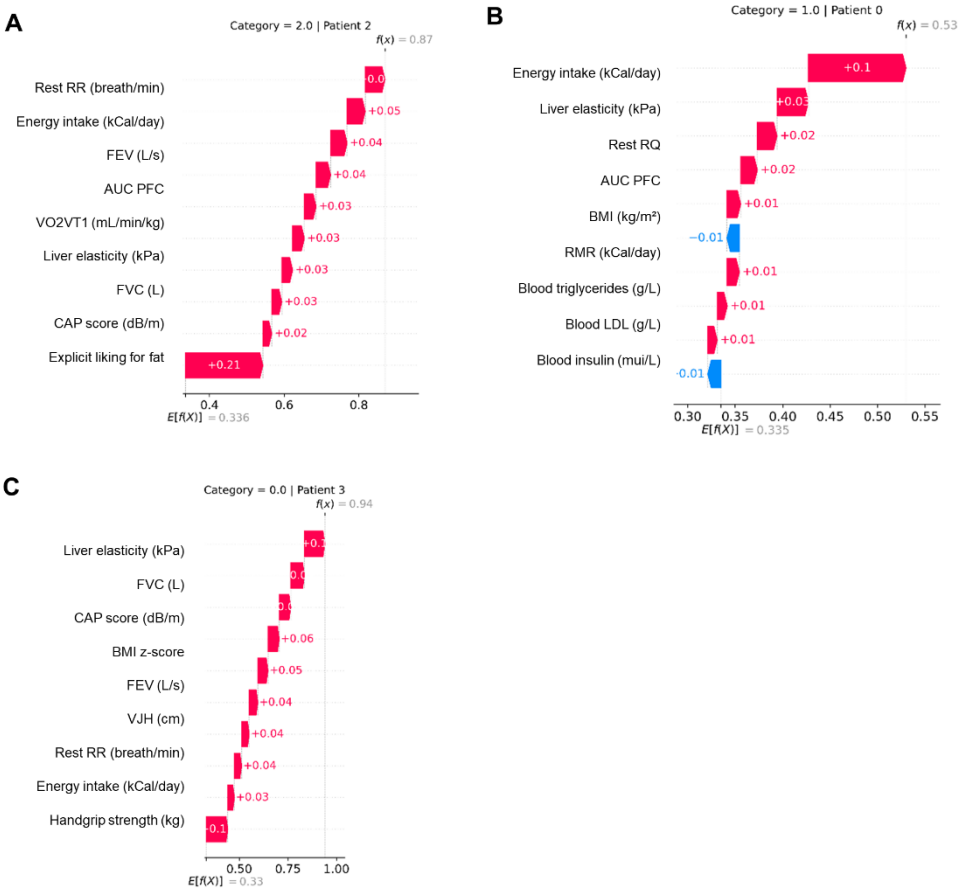
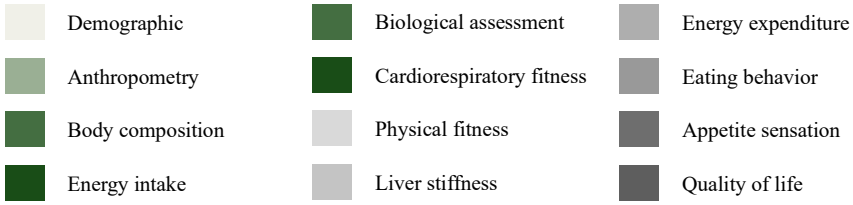


FIGURE S4. Examples of individual SHAP waterfall plot for each category predicted by the multiclass XGBoost classifier.

Individual waterfall plot of SHAP values for a subject belonging (**A**) to the "low success" category (class=2.0), (**B**) to the "moderate success" category (class=1.0) and (**C**) to the "high success" category (class=0.0). AUC: Area Under the Curve; BMI: Body Mass Index; CAP: Controlled Attenuation Parameter; FEV: Forced Expiratory Volume; FVC: Forced Vital Capacity; LDL: Low-Density Lipoprotein; PFC: Prospective Food Consumption; RMR: Resting Metabolic Rate; RR: Respiratory Rate; RQ: Respiratory Quotient; VJH: Vertical Jump Height; VO2: oxygen consumption; VT1: first ventilatory threshold.

Table S2. Most influential features in prediction process and the direction of their influence on "low success" prediction.

	Binary (with MI)	Multiclass (with MI)	Binary (CCA)	Multiclass (CCA)
1	↓ Fullness AUC	↑ Energy intake (kCal/day)	↑ Mild cognitive restriction	↑ Energy intake (kCal/day)
2	↑ FEV (L/s)	↑ FEV (L/s)	↑ Low external eating	↓ High cognitive restriction
3	↑ Rest VO2 (mL/min)	↑ PFC AUC	↓ Fullness SQ	↑ Fat free mass (kg)
4	↓ Liver elasticity (kPa)	↑ VJH (cm)	↓ Fat mass (%)	↑ High emotional eating
5	↑ MAP (w)	↓ Blood insulin (mui/L)	↑ High SF36 physical score	↓ Protein intake (%)
6	↑ VJH (cm)	↓ Male sex	↓ High external eating	– Carbohydrates intake (%)
7	↓ Hunger AUC	↑ FVC (L)	↓ Low SF36 physical score	↑ Age (years)
8	↓ Explicit liking for fat	↑ Blood cholesterol (g/L)	↓ BMI percentile	↓ Hunger SQ
9	↑ Protein intake (%)	↑ MAP (w)	↓ High cognitive restriction	↓ Fat mass (kg)
10	↑ VO2VT1 (mL/min/kg)	– Blood glucose (g/L)	↑ Fat intake (%)	↑ High SF36 physical score
11	↓ Implicit liking for fat	↑ DTE AUC	↑ High emotional eating	↓ Fat intake (%)
12	↓ Blood cholesterol (g/L)	↓ Liver elasticity (kPa)	↓ BMI z-score	↓ PFC SQ
13	↓ BMI z-score	↓ PFC SQ	↓ Protein intake (%)	↑ Body weight (kg)
14	↓ BES score	↓ VO2VT1 (mL/min/kg)	↑ Male sex	↑ BMI z score
15	↓ Male sex	↓ BMI z-score	↓ Carbohydrates intake (%)	↑ Mild cognitive restriction
16	↓ RMR (kCal/day)	↓ Fat intake (%)	↑ Fat free mass (kg)	↓ BMI (kg/m²)
17	↑ Choice for fat	– Handgrip strength (kg)	↓ Low emotional eating	– Fullness SQ
18	↑ DTE AUC	– Rest RR (breath/min)	↓ Body weight (kg)	↓ Low external eating
19	↓ Cognitive restriction	– Rest RQ	↓ BMI (kg/m²)	↓ Low emotional eating
20	↑ Fullness SQ	↑ Choice for taste	↑ Hunger SQ	↓ Fat mass (%)



↑: a higher value pushes the prediction towards "high success"; ↓: a lower value pushes the prediction towards "high success"; –: undetermined; AUC: Area Under the Curve; BES: Binge Eating Scale; BMI: Body Mass Index; CCA: Complete Case Analysis; DEBQ: Dutch Eating Behavior Questionnaire; DTE: Desire To Eat; EI: Energy Intake; FEV: Forced Expiratory Volume; FVC: Forced vital capacity; MI: Multiple Imputation; PFC: Prospective Food Consumption; RMR: Resting Metabolic Rate; RQ: Respiratory Quotient; RR: Respiratory Rate; SF36: Short Form-36; SQ: Satiety quotient; VAS: Visual Analogue Scale; VJH: Vertical Jump Height; VO2: Oxygen consumption; VT1: Ventilatory Threshold 1.Models for the binary tasks are random forest classifier and for the multiclass tasks are XGBoost.