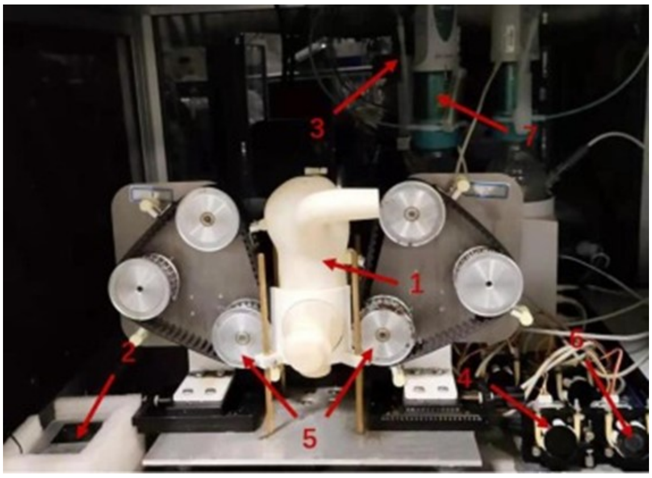
Supplementary data

2.2 Preparation of steamed rice and determination of the main components of cooked rice flour

Moisture content was measured by direct drying method. According to AOAC's official method 930.29 (AOAC, 2005) [1], the total nitrogen content was determined by Kjeldahl method, and then the nitrogen-protein conversion factors of 5.95 was used to obtain the total protein content of rice. Fat was obtained by Soxhlet extraction [2], and the muffle furnace was used to measure ash. The total starch content was determined using the total starch kit (K-TSTA 04/2009, Megazyme, Wicklow, Ireland). It was modified slightly according to the AOAC method 996.11 (using heat-resistant α-amylase with activity and stability under pH 5), and then operated according to the program to quickly get the total starch content. The amylose content was detected using amylose kit (A152-1-1, Nanjing Jiancheng Technology Co., Ltd, China). Using 80 % ethanol can separate the soluble sugar in the sample from the starch, and the complex formed by straight starch and iodine has an absorption peak at 620 nm. Then perform specific operations according to the instructions and calculate it through the formula.

2.11.2 *In vitro* gastric digestion



Supplementary Fig. 1. Artificial Gastric Digestive System (AGDS) system [3]. (1) in vitro adult stomach model; (2) temperature-controlled device; (3) acid syringe; (4) gastric digesta emptying pump; (5) compression device; (6) enzyme and digestive juice injection pump; (7) pH stat.

Supplemental Table 1 Composition of cooked japonica, indica and waxy rice flour.

	Japonica rice	Indica rice	Waxy rice
Moisture（%）	56.56 ± 0.90^{a}	58.41 ± 0.29^{a}	53.40 ± 1.37^{b}
Protein（%）	3.38 ± 0.09^{b}	3.39 ± 0.01^{b}	3.77 ± 0.11^{a}
Ash（%）	0.20 ± 0.01^{a}	0.16 ± 0.01^{b}	0.14 ± 0.01^{c}
Total starch（%）	36.43 ± 3.15^{a}	30.98 ± 1.32^{b}	35.42 ± 2.20^{ab}
Amylose（%）	6.75 ± 0.20^{a}	5.26 ± 0.14^{b}	0.84 ± 0.04^{c}
Lipids（%）	0.27 ± 0.01^{ab}	0.31 ± 0.03^{a}	0.23 ± 0.03^{b}

Data were the mean ± standard deviation of three determinations. a, b and c indicated significant differences ($p < 0.05$) for the same component among different rice flour.

Supplemental Table 2 Chewing parameters for cooked japonica, indica and waxy rice by volunteers with different chewing ability.

	Japonica rice		Indica rice		Waxy rice	
	SC	WC	SC	WC	SC	WC
Chewing time (s)	14.9±0.7^{c}	26.3±1.3^{a}	15.7±0.4^{c}	27.3±1.5^{a}	11.0±0.6^{d}	19.6±2.1^{b}
Number of chews (n)	22.0±1.7^{c}	42.0±1.4^{a}	20.7±1.5^{c}	42.8±1.6^{a}	16.2±0.4^{d}	29.1±1.7^{b}
Chewing frequency (n/s)	1.5±0.1^{a}	1.6±0.1^{a}	1.3±0.1^{b}	1.6±0.1^{a}	1.5±0.1^{a}	1.5±0.1^{a}

Note: Data were mean ± standard deviation of 3 replicates. Different lowercase letters in the same row represented significant differences ($p < 0.05$). SC was strong chewing and WC was weak chewing.

Supplemental Table 3 Textural characteristics of swallowable bolus of japonica, indica and waxy rice chewing by volunteers with different chewing ability.

	Hardness (g)	Stickiness (g.s)	Elasticity (%)	Cohesion	Responsiveness (%)
JR	4089.4 ± 224.4^{A}	-34.7 ± 5.4^{B}	60.5 ± 3.9^{A}	0.6 ± 0.1^{A}	84.1 ± 3.1^{A}
IR	3532.8 ± 216.5^{B}	-11.0 ± 3.7^{A}	56.0 ± 6.0^{AB}	0.5 ± 0.1^{B}	78.8 ± 6.8^{B}
WR	2979.4 ± 179.7^{C}	-44.7 ± 13.4^{C}	56.6 ± 5.8^{B}	0.4 ± 0.1^{C}	65.8 ± 3.2^{C}
JR-SC	924.8 ± 244.2^{a}	-32.1 ± 10.5^{a}	34.1 ± 4.0^{b}	0.2 ± 0.1^{b}	12.9 ± 1.1^{b}
JR-WC	763.1 ± 146.6^{a}	-46.1 ± 10.9^{a}	58.0 ± 8.2^{a}	0.8 ± 0.1^{a}	65.2 ± 5.0^{a}
IR-SC	1056.0 ± 252.9^{a}	-27.9 ± 10.1^{a}	26.6 ± 9.8^{b}	0.3 ± 0.1^{b}	9.4 ± 0.6^{b}
IR-WC	603.2 ± 173.1^{b}	-55.0 ± 44.3^{a}	21.9 ± 5.1^{b}	0.2 ± 0.1^{b}	11.5 ± 1.0^{b}
WR-SC	975.4 ± 112.9^{a}	-22.2 ± 3.5^{a}	27.1 ± 1.4^{bc}	0.2 ± 0.1^{bc}	11.8 ± 0.5^{b}
WR-WC	794.9 ± 107.1^{a}	-46.7 ± 19.7^{a}	32.8 ± 2.9^{bc}	0.3 ± 0.1^{bc}	12.1 ± 0.7^{b}

Note: Data were mean ± standard deviation. Different lowercase letters in the same column indicated significant differences ($p < 0.05$). A, B and C indicated significant differences ($p < 0.05$) among original rice (JR, IR, WR).

Elasticity、Cohesion、Responsiveness：interactions chewing ability × types of rice were significant, $p = 0.049$, $p < 0.001$, $p < 0.001$.

Supplemental Table 4 Correlation analysis of oral chewing and gastrointestinal digestion properties of cooked rice.

	Saliva content	Particle weight ratio (< 0.5 mm)	Starch hydrolysis rate				Gastric retention rate	
			Oral	G30	G240	I120	G30	G240
Saliva content	1	-0.328	0.820^{**}	0.870^{**}	0.818^{**}	-0.115	0.593^{**}	0.38
Particle weight ratio (< 0.5 mm)		1	-0.407	-0.606^{**}	-0.580^{*}	-0.369	-0.567^{*}	-0.705^{**}
Starch hydrolysis rate								
Oral			1	0.827^{**}	0.901^{**}	0.328	0.525^{*}	0.587^{*}
G30				1	0.953^{**}	0.201	0.709^{**}	0.680^{**}
G240					1	0.276	0.621^{**}	0.674^{**}
I120						1	0.241	0.747^{**}
Gastric retention rate								
G30							1	0.760^{**}
G240								1

Note: **Significantly associated at level 0.01 (bilateral); *Significantly associated at level 0.05 (bilateral). G30 and G240 represented the samples digested in the stomach for 30 min and 240 min, respectively, and I120 represented the samples digested in the small intestine for 120 min.

References

1. AOAC, 2005. Official Methods of Analysis, 18th ed. Association of Official Analytical Chemists, Gaithersburg, MD.
2. J.-M. Shin, S.-K. Park, Comparison of fat determination methods depending on fat definition in bakery products, *LWT-Food Sci. Tech.*, 2015, **63(2)**, 972-977.
3. M. Lou, C. Ritzoulis, J. Liu, X. Y. Zhang, J. Z. Han and W. L. Liu, *In vitro* digestion of tofu with different textures using an artificial gastric digestive system, *Food Res. Int*., 2022, **157**, 111458.