

## Supplementary Material

**Table S1.** Factor loading of two dietary patterns identified by principal component analysis.

Food groups	Western-dietary pattern	Prudent-dietary pattern
Eggs	0.451	0.124
Meats	0.542	0.089
Innards organs	0.417	0.165
Rice or flour products cooked in oil	0.458	0.168
Jam or honey	0.410	0.132
Sugary beverages	0.542	-0.114
Deep fried foods	0.680	0.014
Preserved vegetables or processed meat/fish	0.613	0.068
Instant noodles	0.372	-0.072
Dipping sauce	0.609	-0.016
Breads	0.291	0.168
Seafood	0.225	0.374
Legumes or beans	0.239	0.372
Light colored vegetables	-0.071	0.795
Dark or leafy vegetables	-0.09	0.812
Vegetables using oil or salad dressing	0.201	0.566
Fruits	-0.185	0.491
Whole grains	0.036	0.397
Root crops	0.132	0.529
Dairy product	0.24	0.287
Rice or flour product	0.276	0.285
Milk	0.03	0.216
<b>Total variation explanation</b>	<b>27.51%</b>	
	<b>14.20%</b>	<b>13.31%</b>

**Table S2.** Adjusted model of beta ( $\beta$ ) coefficients and 95% confidence intervals (CI) of sex hormone biomarkers according to the interaction of lifestyle behaviors.

Lifestyle factors	FSH, IU/L		LH, IU/L		T, ng/mL		E2, pg/mL		Prolactin, ng/mL	
	$\beta$ (95% CI)	P								
<b>Sleeping type by sleeping time</b>										
Well										
Enough	Ref									
Not enough	0.15 (-2.04, 2.34)	NS	0.26 (-0.60, 1.12)	NS	0.13 (-0.26, 0.52)	NS	0.38 (-2.37, 3.13)	NS	-0.12 (-1.35, 1.10)	NS
Insomnia										
Enough	-0.52 (-1.82, 0.77)	NS	-0.10 (-0.62, 0.41)	NS	-0.22 (-0.46, 0.03)	NS	-1.57 (-3.20, 0.06)	NS	0.63 (-0.19, 1.44)	NS
Not enough	0.23 (-1.42, 1.89)	NS	0.07 (-0.58, 0.72)	NS	-0.14 (-0.47, 0.19)	NS	-1.66 (-3.74, 0.41)	NS	-0.33 (-1.68, 1.01)	NS
<b>Sleeping time by Western dietary pattern</b>										
Enough										
Low/moderate	Ref									
High	0.56 (-0.83, 1.95)	NS	0.08 (-0.47, 0.62)	NS	-0.01 (-0.28, 0.25)	NS	-0.79 (-2.54, 0.95)	NS	0.17 (-0.66, 1.01)	NS
Not enough										
Low/moderate	0.62 (-1.02, 2.26)	NS	0.47 (-0.17, 1.11)	NS	0.11 (-0.20, 0.41)	NS	-0.33 (-2.38, 1.72)	NS	-0.40 (-1.62, 0.82)	NS
High	0.92 (-1.21, 3.06)	NS	-0.22 (-1.06, 0.62)	NS	0.06 (-0.36, 0.49)	NS	0.07 (-2.61, 2.75)	NS	-0.45 (-1.80, 0.90)	NS

NS, not significant; FSH, follicle stimulating hormone; LH, luteinizing hormone; T, testosterone; E2, estradiol. Adjusted by age, BMI, FBG, marital status, education level, yearly income, sleeping type, sleeping time, physical activity type, smoking status, and alcohol drinking status.

**Table S3.** Adjusted model of beta ( $\beta$ ) coefficients and 95% confidence intervals (CI) of sperm biomarkers according to interaction of lifestyle behaviors.

Lifestyle factors	SC, M/mL		TSM, %		PRM, %		NSM, %	
	$\beta$ (95% CI)	P						
<b>Smoking by sleeping type</b>								
Not smoker								
Well	Ref		Ref		Ref		Ref	

Insomnia	-0.19 (-3.02, 2.64)	NS	0.25 (-1.38, 1.89)	NS	0.08 (-1.19, 1.36)	NS	-0.25 (-1.72, 1.22)	NS
Smoker								
Well	-1.22 (-4.43, 1.99)	NS	0.89 (-0.97, 2.75)	NS	0.64 (-0.80, 2.09)	NS	-1.14 (-2.80, 0.53)	NS
Insomnia	-0.09 (-3.58, 3.40)	NS	1.68 (-0.33, 3.70)	NS	0.99 (-0.58, 2.56)	NS	-1.16 (-2.96, 0.65)	NS
<b>Smoking by sleeping time</b>								
Not smoker								
Enough	Ref		Ref		Ref		Ref	
Not enough	-0.77 (-4.53, 2.98)	NS	-0.85 (-2.54, 0.84)	NS	-1.63 (-3.80, 0.54)	NS	-1.57 (-3.51, 0.38)	NS
Smoker								
Enough	-0.43 (-3.18, 2.30)	NS	0.81 (-0.42, 2.04)	NS	0.66 (-0.92, 2.25)	NS	-1.23 (-2.66, 0.19)	NS
Not enough	-2.31 (-6.70, 2.08)	NS	-0.31 (-2.28, 1.66)	NS	1.36 (-1.18, 3.89)	NS	-1.82 (-4.09, 0.46)	NS
<b>Smoking by Western dietary pattern</b>								
Not smoker								
Low/moderate	Ref		Ref		Ref		Ref	
High	-3.48 (-6.41, -0.54)	<b>0.02</b>	0.02 (-1.30, 1.34)	NS	0.26 (-1.44, 1.96)	NS	-1.49 (-3.01, 0.03)	NS
Smoker								
Low/moderate	-2.38 (-5.91, 1.14)	NS	1.18 (-0.23, 2.59)	NS	1.76 (-0.06, 3.57)	NS	1.04 (-2.67, 0.58)	NS
High	-3.59 (-7.40, 0.22)	NS	0.19 (-1.37, 1.76)	NS	0.48 (-1.54, 2.49)	NS	-2.29 (-4.09, -0.48)	<b>0.013</b>
<b>Drinking by physical activity type</b>								
Not drinker								
Moderate/intense	Ref		Ref		Ref		Ref	
No/light	0.47 (-2.05, 2.98)	NS	0.31 (-0.82, 1.44)	NS	0.26 (-1.19, 1.71)	NS	-0.49 (-1.79, 0.81)	NS
Drinker								
Moderate/intense	1.36 (-2.94, 5.65)	NS	1.30 (-0.63, 3.22)	NS	-1.51 (-4.04, 1.03)	NS	0.27 (-1.95, 2.49)	NS
No/light	2.83 (-1.55, 7.22)	NS	-0.07 (-2.05, 1.90)	NS	1.51 (-0.97, 3.99)	NS	-2.22 (-4.49, 0.05)	NS
<b>Drinking by sleeping type</b>								
Not drinker								
Well	Ref		Ref		Ref		Ref	
Insomnia	-0.08 (-2.59, 2.43)	NS	0.19 (-0.94, 1.32)	NS	0.50 (-0.95, 1.96)	NS	-0.20 (-1.50, 1.10)	NS
Drinker								
Well	0.93 (-3.22, 5.07)	NS	0.47 (-1.40, 2.33)	NS	0.01 (-2.39, 2.40)	NS	-0.82 (-2.97, 1.32)	NS
Insomnia	2.86 (-1.43, 7.15)	NS	0.60 (-1.33, 2.53)	NS	0.18 (-2.30, 2.66)	NS	-0.85 (-3.07, 1.37)	NS
<b>Drinking by sleeping time</b>								
Not drinker								
Enough	Ref		Ref		Ref		Ref	
Not enough	-1.52 (-4.73, 1.69)	NS	-0.43 (-1.87, 1.01)	NS	-0.01 (-1.86, 1.84)	NS	-1.61 (-3.27, 0.05)	NS
Drinker								
Enough	1.55 (-1.84, 4.96)	NS	1.00 (-0.53, 2.52)	NS	0.57 (-1.40, 2.54)	NS	-1.21 (-2.97, 0.55)	NS
Not enough	1.65 (-4.59, 7.90)	NS	-2.30 (-5.10, 0.51)	NS	-3.14 (-6.75, 0.47)	NS	-0.42 (-3.65, 2.82)	NS
<b>Physical activity type by sleeping type</b>								
Moderate/intense								
Well	Ref		Ref		Ref		Ref	
Insomnia	-0.94 (-4.30, 2.41)	NS	0.21 (-1.30, 1.72)	NS	0.23 (-1.71, 2.17)	NS	0.04 (-1.70, 1.78)	NS
No/light								
Well	-0.31 (-3.29, 2.68)	NS	0.04 (-1.30, 1.38)	NS	-0.48 (-2.21, 1.24)	NS	-0.68 (-2.23, 0.86)	NS
Insomnia	1.01 (-2.23, 4.25)	NS	0.19 (-1.26, 1.65)	NS	0.14 (-1.73, 2.02)	NS	-1.02 (-2.70, 0.65)	NS
<b>Physical activity type by sleeping time</b>								
Moderate/intense								
Enough	Ref		Ref		Ref		Ref	
Not enough	-3.03 (-7.60, 1.55)	NS	-1.96 (-4.02, 0.09)	NS	-1.07 (-3.72, 1.57)	NS	-1.49 (-3.86, 0.88)	NS
No/light								
Enough	0.11 (-2.40, 2.62)	NS	-0.28 (-1.41, 0.85)	NS	-0.43 (-1.88, 1.02)	NS	-0.94 (-2.24, 0.37)	NS
Not enough	0.10 (-3.71, 3.91)	NS	-0.57 (-2.28, 1.15)	NS	-0.86 (-3.07, 1.34)	NS	-1.89 (-3.86, 0.08)	NS
<b>Sleeping type by sleeping time</b>								
Well								
Enough	Ref		Ref		Ref		Ref	
Not enough	-0.91 (-4.77, 2.95)	NS	-1.23 (-2.97, 0.50)	NS	-0.54 (-2.78, 1.69)	NS	-0.82 (-2.82, 1.18)	NS
Insomnia								
Enough	0.42 (-2.11, 2.94)	NS	0.06 (-1.07, 1.19)	NS	0.51 (-0.95, 1.97)	NS	-0.02 (-1.32, 1.29)	NS
Not enough	-1.21 (-5.44, 3.03)	NS	-0.55 (-2.45, 1.36)	NS	-0.37 (-2.81, 2.08)	NS	1.63 (-3.83, 0.56)	NS

NS, not significant; SC, sperm concentration; TSM, total sperm motility; PRM, progressive motility; NSM, normal sperm morphology. Adjusted by age, BMI, FBG, marital status, education level, yearly income, sleeping type, sleeping time, physical activity type, smoking status, and alcohol drinking status.