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· 临床研究 ·

## 鼻尖突度变化对上唇前突感的影响

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**【摘要】** 目的 探讨鼻尖突度变化对上唇前突感的影响,为软组织美貌的改善提供参考依据。方法 获得模特知情同意及肖像授权,使用三维立体摄像机拍摄1名女性模特并获取其面部3D模型,使用ZBRUSH2019软件在原始模型基础上模拟鼻尖突度变化,制作出9段面部动态旋转视频,通过问卷网站创建电子问卷,随机选择正畸科患者、口腔正畸专业相关人员以及普通成年人作为受试者填写电子问卷,评价不同鼻尖突度对于上唇前突感的影响。问卷中采用视觉模拟评分法(visual analogue scale, VAS)评价上唇突出的感观程度,分数越高表示受试者认为图像中模特的上唇越突出。采用广义线性混合模型对问卷数据进行统计学分析。结果 总体上随着3D模型鼻尖突度递减,受试者评价上唇突出的分数增高。交互效应分析显示,在男性受试者中:当鼻尖突度变量为+6 mm、+4.5 mm时,普通人群受试者的分数高于正畸科患者受试者( $P = 0.023$ ,  $P = 0.047$ );当鼻尖突度+6 mm时,普通人群受试者的分数同时高于口腔正畸专业相关人员受试者( $P = 0.023$ );当鼻尖突度为-6 mm时,普通人群受试者的分数低于正畸科患者受试者( $P = 0.003$ ),其余各重测距离组间差异均无统计学意义( $P > 0.05$ )。结论 当鼻尖部突度递减,受试人群均产生上唇前突的视错觉现象;而当鼻尖突度过大时,普通人群评价上唇突出的视错觉现象最为明显。

**【关键词】** 正畸; 口腔; 面部美学; 视错觉; 面部三维动态捕捉系统; 三维图像; 鼻尖突度; 唇突度

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**A study of the effect of changes in nasal tip prominence on the sense of anterior prominence of the upper lip**

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**【Abstract】 Objective** The aim of this study was to investigate the effect of changes in nasal tip protrusion on the sense of upper lip protrusion in different populations and to provide a reference for the improvement of soft tissue beauty. **Methods** Informed consent and portrait authorization were obtained from the model. A female model whose face met the criteria was selected, and a 3D model of her was obtained using a 3D stereo camera. Based on the original model, ZBRUSH2019 software was used to simulate changes in nose tip protrusion. Then, 9 segments of facial dynamic rotation videos were produced, and an electronic questionnaire was created through a questionnaire website to evaluate the effect of different nose tip protrusions on perceived upper lip protrusion. Randomly selected orthodontic patients, orthodontics professionals and general adults completed the electronic questionnaire. In the questionnaire, a Visual Analog Scale was used to evaluate the perceived degree of protrusion of the upper lip. The higher the score, the more prominent the upper lip of the model in the image. The questionnaire data were statistically analyzed using a generalized linear

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mixed model. **Results** As the nasal tip position became progressively more retracted, the subjects' upper lip protrusion scores increased. Among male subjects, the results showed that the general population thought that the upper lip protrusion was higher than the patients did when the nasal tip protrusion was +6 mm and +4.5 mm ( $P = 0.023$ ,  $P = 0.047$ ). When the nasal tip protrusion was +6 mm, the scores of the general population were higher than those of the orthodontics professionals ( $P = 0.023$ ). However, when the nasal tip variable was -6 mm, their score was lower than that of the patients ( $P = 0.003$ ), and there was no significant difference in other retest distances between groups ( $P > 0.05$ ). **Conclusion** When the protrusion of the nasal tip decreased, the three groups experienced a visual illusion of upper lip protrusion. When the nasal tip protrusion is too large, the general population perceived the visual illusion of the upper lip protrusion as being more obvious.

**【Key words】** orthodontics; dental; facial aesthetics; visual illusion; 3dMD; 3D image; nasal tip prominence; lip protrusion

**【Trial registration】** ChiCTR2200060079

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**【Competing interests】** The authors declare no competing interests.

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鼻子位于面部的中央,与其他五官的比例平衡至关重要,能直接影响到面部的美观度,但过于突出的鼻部不仅被认为没有吸引力,还可能导致嘴唇突度感知被扭曲<sup>[1]</sup>。Allgayer等<sup>[2-3]</sup>研究表明在正畸过程中前牙的唇舌向倾斜与鼻唇沟、颏唇沟变化有着紧密关系,正畸矫治对于鼻形态也会有轻微影响<sup>[4]</sup>。面部五官的平衡对于面部美感起着重要作用,还会影响人际交流及患者的自信度<sup>[5-7]</sup>,鼻、唇、颏三者之间的关系常为面部侧貌美学研究的重要内容<sup>[8]</sup>,且唇部与其他五官相互影响<sup>[9-10]</sup>。Briemann等<sup>[11]</sup>利用眼动仪观察参与者眼部注视轨迹,发现参与者在亚洲人脸上注视鼻子的频率明显更高。西方人更容易从眼睛获取信息,而东方人更容易从鼻子获取信息<sup>[12]</sup>。本研究将视错觉原理放入电子问卷之中,使用三维立体拍摄技术,探讨鼻尖突度变化对上唇前突感的影响,为临床上软组织美貌的改善提供参考依据。

## 1 资料和方法

### 1.1 模型的取得与建立

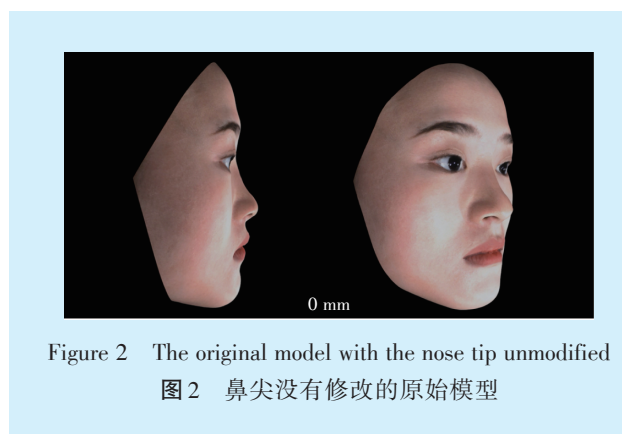
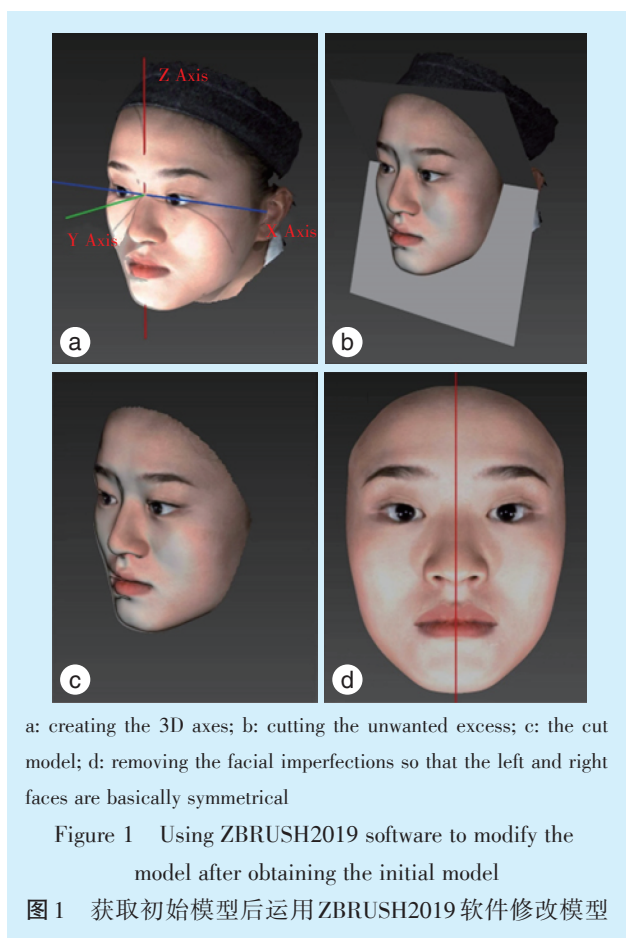
本研究经中国临床试验注册中心批准(审批号:ChiCTR2200060079)、中山大学附属口腔医院伦理委员会同意(审批号:KQEC-2021-22-02)。挑选女性模特1名,纳入标准为:骨性I类、安氏I类咬合;牙列拥挤度 $\leq$ I度,覆胎覆盖正常;恒牙除第三磨牙外均萌出;无颌面部软硬组织畸形,无正畸、正颌治疗史,无面部整形治疗史。模特须了解本研究目的及研究方法,并签署知情同意书及肖像授权书。

拍摄前嘱咐模特不化妆、不戴眼镜,佩戴发箍以防头发遮挡面容。进行三维面部拍摄程序:首先使用白色十字板校正3dMD面部动态摄影系统(3dMD Face Dynamic System)摄像机参数。拍摄时模特呈端正坐位,距离拍摄机器约1 m距离,令其头部自然摆放,双眼平视前方,唇自然闭合,后牙轻咬在牙尖交错位,面部肌群放松,不做吞咽、咀嚼动作,即刻曝光拍摄。

获取初始模型后运用ZBRUSH2019软件修改模型。首先建立3D坐标轴,X轴:通过软组织鼻根点与水平面及瞳孔连线平行;Y轴:通过软组织鼻根点在矢状面上与FH平面垂直;Z轴:通过软组织鼻根点并同时垂直于X、Y轴。除去颅面部多余部分,去除面部细小瑕疵,使左右脸基本对称(图1)。鼻尖部突度变量为等距1.5 mm,使鼻尖在Y轴方向上向前向后依次修改1.5 mm、3.0 mm、4.5 mm、6.0 mm,保持鼻唇角不发生变化,使用3Dmax2016软件制作出模特右边侧貌旋转至左边侧貌时长各为6 s的9段动态视频(图2、图3)。

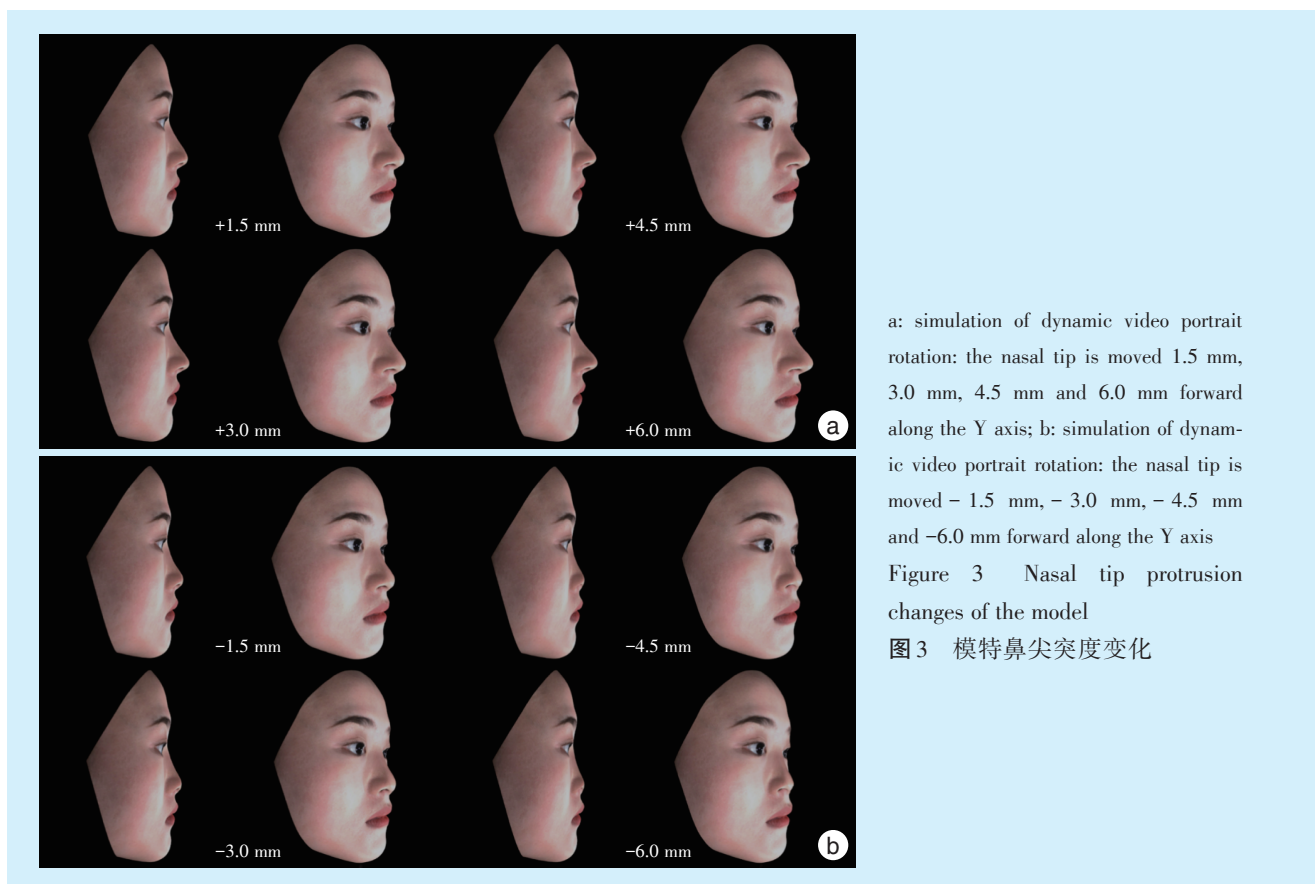
### 1.2 建立问卷

通过问卷网站创建电子问卷,内容包含了受访者的基本信息:性别、人群分类。上唇前突感题目顺序依次是鼻尖在Y轴方向+6 mm、+4.5 mm、+3 mm、+1.5 mm、0 mm、-1.5 mm、-3 mm、-4.5 mm、-6 mm。采用视觉模拟评分法(visual analogue scale, VAS):0分代表不觉得上唇突出,1~9分为上唇突度感官,分数越高表示上唇前突感越强,10分则表示上唇前突感最强烈。



### 1.3 填写电子问卷

随机选取2020年9月至2022年3月就诊于中山大学附属口腔医院正畸科的135例患者、45名口腔正畸专业相关人员及124名普通成年人,共计304人。其中男性146人,女性158人。正畸科患者纳入标准:①年龄大于18周岁;②正畸科初诊或复诊患者;③母语为中文,能读懂问卷上文字和选项;④知情并同意电子审美问卷结果可纳入本研究。口腔正畸专业相关人员纳入标准:①年龄大于18周岁;②具有口腔医师资格证;③经历过口腔正畸科专业培训至少1年;④母语为中文,能读懂



问卷上文字和选项;⑤知情并同意电子审美问卷结果可纳入本研究。普通成年人纳入标准:①年龄大于18周岁;②未曾经历正畸治疗或本身无正畸治疗需求;③不从事口腔医学行业、未学习过口腔医学专业;④母语为中文,能读懂问卷上文字和选项;⑤知情并同意电子审美问卷结果可纳入本研究。排除标准:①年龄小于18周岁;②文盲或存在精神疾病患者无法读懂问卷文字及选项。

#### 1.4 统计方法

本次研究为重复测量设计,根据鼻尖部相对上唇距离的改变,重复测量9次受访者对上唇突度的感官打分。上唇位置不变,鼻尖相对距离每次变量为1.5 mm,从+6 mm依次递减至-6 mm,其中相对距离为0 mm时表示为鼻尖与上唇正常相对距离。采用广义线性混合模型(generalized linear mixed model, GLMM)对重复测量数据进行统计学分析, $P < 0.05$ 为差异有统计学意义。

## 2 结果

本研究共向332例受试者发放调查问卷,问卷回收率100.00%。排除8例小于18岁的受试者及20份问卷回答时长小于50 s的问卷,最后纳入分析的共有304人,有效率为91.57%。

本次研究根据现有数据计算得到检验效能为0.956。共纳入304例受试者进入最终的统计分析,其中男性146例,女性158例;受试者有普通成人124例,正畸科患者135例及口腔专业相关人员45例。问卷整体评分男性均数为2.67,女性为2.38;普通人群评分均数为2.83,正畸科患者均数为2.46,专业相关人员为2.28(表1)。

表1 调查对象基本资料与问卷整体评分

	<i>n</i>	Overall score of the questionnaire
Gender		
Male	146	2.67 (2.33, 3.00)
Female	158	2.38 (2.05, 2.72)
Group		
General population	124	2.83 (2.50, 3.16)
Orthodontic patient	135	2.46 (2.14, 2.78)
Dental professional	45	2.28 (1.74, 2.83)

表2显示鼻尖相对上唇距离存在主效应( $F = 41.608, P < 0.001$ ),重测感官分值差异有统计学意义,即随着鼻尖至上唇相对距离的改变,感官分值

的改变不为0;三因素间存在交互作用( $F = 1.556, P = 0.013$ );简单交互效应显示,除人群与距离之间存在简单交互效应,其余变量间均不存在交互效应,因此进行简单简单效应分析。

表2 主效应及交互效应分析

	<i>F</i>	<i>P</i>
Distance	41.608	< 0.001
Gender	1.404	0.236
Group	1.965	0.140
Interaction between the three factors	1.556	0.013
Interaction between gender and distance	0.141	0.997
Interaction between group and distance	3.154	< 0.001
Interaction between gender and group	0.020	0.980

### 2.1 主效应分析

表3为各距离感官分值之间的均数差值矩阵表,除+4.5 mm与+3.0 mm之间差值无统计学意义( $P = 0.129$ ),其余所有观测点间差异均具有统计学意义( $P < 0.05$ )。表明受试者的感官分值随着鼻尖突度的递减,任意相邻突度间的差值为负数并且突度变化越大感官分值差值越大。受试者在不同鼻尖突度的感官分值详见表4。

### 2.2 交互效应分析

根据表5三因素交互作用简单简单效应分析结果可知,3组人群中的女性在各重测距离间的差异无统计学意义。男性中,普通人群与正畸患者在鼻尖距离上唇+6、+4.5、-6 mm时的畸形感官分值差异均有统计学意义,效应值分别为1.14( $P = 0.023$ )、1.03( $P = 0.047$ )、-1.09( $P = 0.030$ );普通人群与专业相关人员在鼻尖距离上唇+6 mm时的评

表3 鼻尖相对下唇各距离感官分值的均数差值矩阵

Distance/mm	+6.0	+4.5	+3.0	+1.5	0.0	-1.5	-3.0	-4.5	-6.0
+6.0	0.00	-0.25	-0.38	-0.60	-0.81	-1.07	-1.49	-2.32	-3.07
+4.5		0.00	-0.13 <sup>a</sup>	-0.34	-0.56	-0.81	-1.24	-2.07	-2.82
+3.0			0.00	-0.21	-0.43	-0.68	-1.11	-1.94	-2.69
+1.5				0.00	-0.22	-0.47	-0.89	-1.72	-2.48
0.0					0.00	-0.25	-0.68	-1.51	-2.26
-1.5						0.00	-0.42	-1.25	-2.01
-3.0							0.00	-0.83	-1.58
-4.5								0.00	-0.75
-6.0									0.00

a: indicates no significant difference

表4 鼻尖相对下唇各距离感官分值的均数及其95%置信区间

Table 4 The mean and its 95% confidence interval at each distance from the nose tip to the lower lip

Distance/mm	Mean	95% CI	
		Lower	Upper
+6.0	1.413	1.115	1.711
+4.5	1.665	1.367	1.963
+3.0	1.796	1.498	2.094
+1.5	2.010	1.712	2.308
0.0	2.226	1.928	2.524
-1.5	2.479	2.181	2.777
-3.0	2.903	2.605	3.201
-4.5	3.733	3.435	4.031
-6.0	4.487	4.189	4.785

分值差异有统计学意义,效应值为1.43 ( $P = 0.023$ )。综上,男性普通人群在鼻尖+6 mm时,分数高于患者和专业相关人员;在鼻尖+4.5 mm时分值高于患者,但是在鼻尖-6 mm时的评分要低于患者。其余各重复测量距离组间差异均无统计学意义 ( $P > 0.05$ )。

### 3 讨论

面下1/3容貌审美研究受众多学者关注,主要集中于各类人群对于面下1/3不同部位的审美观,即面部相关部位的吸引力评分<sup>[13-15]</sup>,以及对于面下1/3偏斜现象的发现及容忍度的研究等<sup>[16-18]</sup>。本研究跳出惯常研究模式,在上唇突度为正常的

表5 鼻尖相对下唇各距离感官分值的三因素交互作用简单效应分析

Table 5 The simple simple effects analysis of the three-factor interaction at each distance from the nose tip to the lower lip

Gender	Distance	Population pairwise contrasts	Effect size	SE	Adj. P	95% CI		Gender	Distance	Population pairwise contrasts	Effect size	SE	Adj. P	95% CI	
						Lower	Upper							Lower	Upper
1	Q1	1-2	1.14	0.425	0.023	0.118	2.153	2	Q1	1-2	0.66	0.409	0.231	-0.269	1.596
		1-3	1.43	0.561	0.023	0.162	2.698			1-3	1.04	0.590	0.231	-0.370	2.457
		2-3	0.30	0.583	0.613	-0.848	1.437			2-3	0.38	0.560	0.497	-0.718	1.479
	Q2	1-2	1.03	0.425	0.047	0.011	2.046		Q2	1-2	0.61	0.409	0.278	-0.312	1.522
		1-3	1.15	0.561	0.080	-0.105	2.410			1-3	1.00	0.590	0.269	-0.412	2.415
		2-3	0.12	0.583	0.832	-1.018	1.266			2-3	0.40	0.560	0.479	-0.702	1.495
	Q3	1-2	0.76	0.425	0.222	-0.259	1.777		Q3	1-2	0.58	0.409	0.480	-0.405	1.554
		1-3	0.89	0.561	0.224	-0.366	2.150			1-3	0.70	0.590	0.480	-0.627	2.031
		2-3	0.13	0.583	0.820	-1.009	1.275			2-3	0.13	0.560	0.820	-0.971	1.226
	Q4	1-2	0.66	0.425	0.366	-0.361	1.675		Q4	1-2	0.51	0.409	0.435	-0.411	1.431
		1-3	0.83	0.561	0.366	-0.486	2.148			1-3	0.86	0.590	0.435	-0.553	2.274
		2-3	0.17	0.583	0.765	-0.968	1.316			2-3	0.35	0.560	0.532	-0.748	1.449
	Q5	1-2	0.72	0.425	0.270	-0.297	1.738		Q5	1-2	0.66	0.409	0.320	-0.320	1.639
		1-3	0.87	0.561	0.270	-0.411	2.154			1-3	0.84	0.590	0.320	-0.492	2.168
		2-3	0.15	0.583	0.796	-0.991	1.293			2-3	0.18	0.560	0.750	-0.920	1.277
	Q6	1-2	0.58	0.425	0.384	-0.390	1.552		Q6	1-2	0.63	0.409	0.272	-0.303	1.557
		1-3	0.85	0.561	0.384	-0.489	2.197			1-3	1.00	0.590	0.272	-0.415	2.412
		2-3	0.27	0.583	0.639	-0.869	1.416			2-3	0.37	0.560	0.507	-0.727	1.470
	Q7	1-2	0.01	0.425	> 0.999	-0.829	0.841		Q7	1-2	0.46	0.409	0.770	-0.516	1.443
		1-3	0.20	0.561	> 0.999	-1.143	1.544			1-3	0.49	0.590	0.810	-0.832	1.815
		2-3	0.19	0.583	> 0.999	-1.022	1.411			2-3	0.03	0.560	0.961	-1.071	1.126
	Q8	1-2	-0.10	0.425	> 0.999	-0.972	0.769		Q8	1-2	-0.41	0.409	0.967	-1.384	0.575
		1-3	-0.53	0.561	> 0.999	-1.876	0.811			1-3	-0.23	0.590	> 0.999	-1.554	1.093
		2-3	-0.43	0.583	> 0.999	-1.756	0.895			2-3	0.17	0.560	> 0.999	-0.990	1.338
	Q9	1-2	-1.09	0.425	0.030	-2.112	-0.077		Q9	1-2	-0.68	0.409	0.292	-1.658	0.301
		1-3	-1.04	0.561	0.126	-2.301	0.214			1-3	-0.49	0.590	0.807	-1.817	0.830
		2-3	0.05	0.583	0.930	-1.091	1.193			2-3	0.19	0.560	0.807	-0.934	1.304

The sequential Bonferroni adjusted significance level is 0.05.

Gender 1: male; gender 2: female; population pairwise contrast 1: general population; population pairwise contrast 2: orthodontic patients; population pairwise contrast 3: orthodontics professionals; Q1 to Q9 are the nasal tip is moved +6.0 mm, +4.5 mm, +3.0 mm, +1.5 mm, 0.0 mm, -1.5 mm, -3.0 mm, -4.5 mm, and -6.0 mm

前提下,制作了不同程度的鼻尖前伸位和后退位,探讨因鼻尖位置改变人们对上唇突度感评价的变化情况,研究内容具有新颖性和临床指导意义。

本研究采用较为先进的3D立体摄影技术,相较于平面照片、剪影等,在观察面部软组织时更接近真实状态,减少了因失真可能会造成的审美偏差,目前广泛应用于口腔医学中,如面部美学研究<sup>[16,19]</sup>、口腔颌面外科的术后模拟及修复后的容貌测量、以及正畸前后的软组织测量对比等<sup>[20-21]</sup>。

本研究结果表明当鼻尖突度递减时,受试者觉得上唇前突感增强,即视错觉产生的概率随着鼻尖逐渐后缩而增多。可能与视错觉的整体性相关。视错觉是有关视觉方面的错误知觉,是指在特定环境下或在一定心理因素的短暂影响下,产生对外界事物扭曲的知觉,是主观努力无法克服的心理-生理现象。整体性指的是将被观察对象的局部当成整体来认知的情况。在研究中受试者观察上唇时会不自主地将周围五官综合起来考量,此时邻近上唇的鼻尖部被作为一个重要的参考点,因此出现了鼻尖参考物靠后,即出现上唇突出的视觉假象。本研究结果表明,3组患者同时存在视错觉现象,但不同人群产生的错觉程度各不相同。

本研究在鼻尖突度+6 mm、+4.5 mm时,普通成年人认为上唇突出的错觉最为明显,可能与视错觉中的熟悉性和相邻性有关。熟悉性是指当观察一个物体时,人们会根据自身脑海中熟悉的构想,最终形成错觉。视错觉特性中的相邻性<sup>[22-23]</sup>指的是两物体越接近时,人们会将其当作一个整体去观察。杨振铨<sup>[24]</sup>将鼻部形态与颌骨之间的关系进行了一系列研究,发现鼻的突度从Ⅲ类骨面型、Ⅰ类骨面型至Ⅱ类骨面型渐增大,且临床上Ⅱ类患者侧貌呈凸面型多,Ⅱ类骨面型人群一般存在鼻尖与唇部同时突出的情况,因此在普通人群的既定观念中较突出的鼻子会伴随着突出的唇部,表现出对研究中3D模型有了先入为主的错误认识。而鼻、唇毗连,鼻尖突度过大根据视错觉的相邻性会给人造成唇部也跟着一同突出的视错觉现象。普通成人上唇前突的分数最高,可能与未关注及了解过审美标准有关,而口腔正畸专业相关人员通过系统化的正畸理论知识及技能培训,对于面部软组织各个正常位置及角度有一定的标准认知。Jarosz等<sup>[25-26]</sup>在美学不对称研究结果中发现,没经历过正畸治疗的外行人对于不正常偏斜

敏锐度最低。

鼻尖突度可能会直接影响上唇的突度感观,在临床上除了对于牙颌面下1/3的组织进行矫治前的甄别,还需要对面部其他软组织的总体观进行初步判断。正畸科就诊的病人对治疗结果会有着不同的心理定位和预期。医生必须结合自身的审美素养与患者诉求,提出较周全的治疗措施。在临床上,常见患者上唇突度且牙列咬合、排列均正常,只是因为鼻尖高度不足导致面部不协调,从而引起上唇较突出的视错觉现象,这类患者可通过外科手术或注射整形改变鼻部形态创造更具吸引力的面部轮廓,协调鼻唇之间的审美观感。患者是否有上唇突度异常或鼻尖高度不足,可通过头影测量法、直接观察法、照片分析法等方法判断。侧貌美学中常用上下唇与审美平面或T线之间的距离来判断嘴唇突度,鼻尖至鼻背的距离来表示鼻尖突度。

临床上应加强医患间的沟通,充分说明患者可能存在的视错觉,甄别出真正的问题,理清楚真实的形态异常。避免相对空间位置改变而造成的错觉,如鼻子过于扁平、下前牙舌倾造成的下嘴唇内缩及颏部生长不足等原因造成上唇突出的视错觉等。

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#### 参考文献

- [1] Khosravanifard B, Rakhshan V, Raeesi E. Factors influencing attractiveness of soft tissue profile[J]. *Oral Surg Oral Med Oral Pathol Oral Radiol*, 2013, 115(1): 29 - 37. doi: 10.1016/j.oooo.2012.03.021.
- [2] Allgayer S, Mezomo MB. Do premolar extractions necessarily result in a flat face? No, when properly indicated[J]. *Dental Press J Orthod*, 2018, 23(5): 82 - 92. doi: 10.1590/2177-6709.23.5.082-092.bbo.
- [3] Araújo TM, Caldas LD. Tooth extractions in orthodontics: first or second premolars?[J]. *Dental Press J Orthod*, 2019, 24(3): 88 - 98. doi: 10.1590/2177-6709.24.3.088-098.bbo.
- [4] 曾光. 上颌前方牵引治疗骨性Ⅲ类错合过程中鼻部形态变化的美学意义研究[D]. 西安: 第四军医大学, 2010.  
Zeng G. The esthetics of nasal morphology change in the treatment of skeletal class Ⅲ malocclusion in growing patients [D]. Xi'an: The Fourth Military Medical University, 2010.
- [5] Sun H, Shang HT, He LS, et al. Assessing the quality of life in patients with dentofacial deformities before and after orthognathic surgery[J]. *J Oral Maxillofac Surg*, 2018, 76(10): 2192-2201. doi:

- 10.1016/j.joms.2018.03.026.
- [6] Tüz HH, Ergezen E, Meral SE, et al. Influence of orthognathic surgery on oral health and quality of life[J]. *J Craniofac Surg*, 2022, 33(2): 548-551. doi: 10.1097/SCS.0000000000007691.
- [7] Trinajstić Zrinski M, Pavlic A, Katic V, et al. Effect of personality traits on the association between clinically assessed malocclusion and the psychosocial impact of dental aesthetics[J]. *Orthod Craniofac Res*, 2023, 26(1): 62-71. doi: 10.1111/ocr.12579.
- [8] Kuitert RB, Aydin B. Variatie in beoordeling van aangezichtses-thetiek van vrouwen gedurende de afgelopen 150 jaar[J]. *Ned Tijdschr Tandheelkd*, 2020, 127(12): 683 - 689. doi: 10.5177/ntvt.2020.12.20104.
- [9] Burk SM, Charipova K, Orra S, et al. A surgeon's perspective on the uncorrected skeletal deformity. Part I: unintended consequences on facial structures and esthetic harmony[J]. *Am J Orthod Dentofacial Orthop*, 2022, 161(5): 739 - 745. doi: 10.1016/j.ajodo.2022.01.008.
- [10] Ghorbanyjavadpour F, Rakhshan V. Factors associated with the beauty of soft-tissue profile[J]. *Am J Orthod Dentofacial Orthop*, 2019, 155(6): 832-843. doi: 10.1016/j.ajodo.2018.07.020.
- [11] Brielmann AA, Bühlhoff I, Armann R. Looking at faces from different angles: Europeans fixate different features in Asian and Caucasian faces[J]. *Vision research*, 2014, 100: 105-112. doi: 10.1016/j.visres.2014.04.011.
- [12] Cohen AS, Sasaki JY, German TC, et al. Automatic mechanisms for social attention are culturally penetrable[J]. *Cognitive science*, 2017, 41(1): 242-258. doi: 10.1111/cogs.12329.
- [13] Machado RM, Assad Duarte ME, Jardim da Motta AF, et al. Variations between maxillary central and lateral incisal edges and smile attractiveness[J]. *Am J Orthod Dentofacial Orthop*, 2016, 150(3): 425-35. doi: 10.1016/j.ajodo.2016.02.022.
- [14] Martins JM, Costa LG, Carvalho AL, et al. The impact of dental midline on asymmetric faces: perspective of laypersons and dentists [J]. *Int J Environ Res Public Health*, 2021, 18(24): 12904. doi: 10.3390/ijerph182412904.
- [15] Patusco V, Carvalho CK, Lenza MA, et al. Smile prevails over other facial components of male facial esthetics [J]. *J Am Dent Assoc*, 2018, 149(8): 680-687. doi: 10.1016/j.adaj.2018.03.019.
- [16] Dong T, Ye N, Yuan L, et al. Assessing the influence of chin asymmetry on perceived facial esthetics with 3-dimensional images [J]. *J Oral Maxillofac Surg*, 2020, 78(8): 1389-1396. doi: 10.1016/j.joms.2020.03.017.
- [17] Sadrhaghghi H, Zarghami A, Sadrhaghghi S, et al. Esthetic perception of smile components by orthodontists, general dentists, dental students, artists, and laypersons [J]. *J Investig Clin Dent*, 2017, 8(4). doi: 10.1111/jicd.12235.
- [18] Silva BP, Jiménez-Castellanos E, Stanley K, et al. Layperson's perception of axial midline angulation in asymmetric faces [J]. *J Es-thet Restor Dent*, 2018, 30(2): 119-125. doi: 10.1111/jerd.12347.
- [19] Duran GS, Taşdelen FÖ, Dindaroğlu F. Effect of facial profile convexity on the perception of mandibular asymmetry using three-dimensional stereophotogrammetric images [J]. *Orthod Craniofac Res*, 2020, 23(1): 110-117. doi: 10.1111/ocr.12349.
- [20] Bengtsson M, Wall G, Greiff L, et al. Treatment outcome in orthognathic surgery - a prospective randomized blinded case-controlled comparison of planning accuracy in computer-assisted two- and three-dimensional planning techniques (part II) [J]. *J Craniomaxillofac Surg*, 2017, 45(9): 1419-1424. doi: 10.1016/j.jcms.2017.07.001.
- [21] Perdanasari AT, Wagner RD, Davis MJ, et al. Nasal alar surface area differences after unilateral cleft lip repair: long-term effects of the perialar incision [J]. *J Craniofac Surg*, 2020, 31(6): 1529-1532. doi: 10.1097/SCS.0000000000006284.
- [22] Lin J, Cai Y, Wu X, et al. Graph-based information block detection in infographic with gestalt organization principles [J]. *IEEE Trans Vis Comput Graph*, 2021, PP(99): 1. doi: 10.1109/TVCG.2021.3130071.
- [23] Sarami A, Afhami R, Mokhtari S. Perceptual grouping of random dot patterns in the presence of a tilting frame [J]. *Perception*, 2022, 51(4): 230-243. doi: 10.1177/03010066221081221.
- [24] 杨振铨. 鼻部形态与颌骨结构关系的研究 [D]. 西安: 第四军医大学, 2016.
- Yang ZK. Study on the correlations between nasal morphology and craniofacial structures [D]. Xi'an: the Fourth Military Medical University, 2016.
- [25] Jarosz KF, Bosio JA, Bloomstein R, et al. Perceptions of chin asymmetries among dental professionals and laypersons [J]. *Am J Orthod Dentofac Orthop*, 2018, 154(2): 201-212. doi: 10.1016/j.ajodo.2017.11.029.
- [26] Martins JM, Costa LG, Carvalho AL, et al. The impact of dental midline on asymmetric faces: perspective of laypersons and dentists [J]. *Int J Environ Res Public Health*, 2021, 18(24): 12904. doi: 10.3390/ijerph182412904.

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