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APPENDIX A

Stimulus list in Chapter 2

Table A.1: Stimulus list of disyllabic words. HF, LF, HR, and LR denote High Falling, Low Falling, High Rising, and Low Rising tones, respectively.

$\sigma 1$	$\sigma 2$	Item 1		Item 2	
HF	HF	中央	‘center’	声音	‘sound’
HF	LF	清明	‘clear and bright’	光荣	‘honor’
HF	HR	安稳	‘stable’	东海	‘East Sea’
HF	LR	经理	‘manager’	修养	‘cultivation’
LF	HF	平安	‘safe’	床单	‘bedsheet’
LF	LF	来源	‘source’	田螺	‘river snail’
LF	HR	棉袄	‘cotton jacket’	牛肚	‘tripe’
LF	LR	原理	‘principle’	朋友	‘friend’
HR	HF	酒杯	‘wine glass’	口音	‘accent’
HR	LF	广场	‘square’	本能	‘instinct’
HR	HR	水果	‘fruit’	躺椅	‘reclining chair’

$\sigma 1$	$\sigma 2$	Item 1		Item 2	
HR	LR	展览	‘exhibition’	表演	‘performance’
LR	HF	雨衣	‘raincoat’	尾巴	‘tail’
LR	LF	蚂蟥	‘leech’	野蛮	‘barbaric’
LR	HR	老板	‘boss’	耳朵	‘ear’
LR	LR	玛瑙	‘agate’	道理	‘reason’

APPENDIX B

Stimulus list in Chapter 3

Table B.1: Stimulus list of 2+1 compounds. HF, LF, HR, and LR denote High Falling, Low Falling, High Rising, and Low Rising tones, respectively.

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
HF	HF	HF	收音机	‘radio’
HF	HF	LF	天安门	‘Tiananmen’
HF	HF	HR	天花板	‘ceiling’
HF	HF	LR	花生米	‘peanut kernels’
HF	LF	HF	蜗牛霜	‘snail cream’
HF	LF	LF	天鹅绒	‘velvet’
HF	LF	HR	西洋狗	‘foreign dog’
HF	LF	LR	双人舞	‘duet dance’
HF	HR	HF	羞耻心	‘sense of shame’
HF	HR	LF	跟斗云	‘somersault cloud’
HF	HR	HR	车管所	‘vehicle administration office’

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
HF	HR	LR	标准舞	'ballroom dance'
HF	LR	HF	师范生	'normal-school student'
HF	LR	LF	乌鳢鱼	'snakehead fish'
HF	LR	HR	莴苣笋	'lettuce shoots'
HF	LR	LR	千里马	'swift horse'
LF	HF	HF	台风天	'typhoon day'
LF	HF	LF	鱼肝油	'cod liver oil'
LF	HF	HR	无花果	'fig'
LF	HF	LR	桃花眼	'peach-blossom eyes'
LF	LF	HF	棉毛衫	'cotton undershirt'
LF	LF	LF	调和油	'blended cooking oil'
LF	LF	HR	葡萄酒	'grape wine'
LF	LF	LR	黄梅雨	'plum rain'
LF	HR	HF	童子鸡	'young chicken'
LF	HR	LF	啤酒瓶	'beer bottle'
LF	HR	HR	油纸伞	'oil-paper umbrella'
LF	HR	LR	门诊部	'outpatient department'
LF	LR	HF	人造丝	'rayon'
LF	LR	LF	疗养团	'convalescent group'
LF	LR	HR	营养品	'dietary supplements'
LF	LR	LR	行李站	'(left-)luggage office'
HR	HF	HF	水晶宫	'crystal palace'
HR	HF	LF	火烧云	'flaming clouds'
HR	HF	HR	感光纸	'photosensitive paper'
HR	HF	LR	火车站	'train station'
HR	LF	HF	指南针	'compass'
HR	LF	LF	嘴唇皮	'lip skin'
HR	LF	HR	海南岛	'Hainan Island'
HR	LF	LR	广场舞	'square dance'

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
HR	HR	HF	保险箱	‘safe’
HR	HR	LF	保险员	‘insurance agent’
HR	HR	HR	水果酒	‘fruit wine’
HR	HR	LR	起点站	‘starting station’
HR	LR	HF	走马灯	‘revolving lantern’
HR	LR	LF	指导员	‘instructor’
HR	LR	HR	展览馆	‘exhibition hall’
HR	LR	LR	管理站	‘administration station’
LR	HF	HF	牡丹花	‘peony’
LR	HF	LF	雨花台	‘Yuhuatai’
LR	HF	HR	美洲虎	‘jaguar’
LR	HF	LR	老花眼	‘presbyopia’
LR	LF	HF	橡皮筋	‘rubber band’
LR	LF	LF	鲤鱼旗	‘carp banner’
LR	LF	HR	象棋馆	‘chess club’
LR	LF	LR	肚皮眼	‘navel’
LR	HR	HF	老虎机	‘slot machine’
LR	HR	LF	老虎钳	‘pliers’
LR	HR	HR	耳朵孔	‘earhole’
LR	HR	LR	耳朵眼	‘earhole’
LR	LR	HF	养老金	‘pension’
LR	LR	LF	丈母娘	‘mother-in-law’
LR	LR	HR	领导者	‘leader’
LR	LR	LR	武士道	‘bushido’

Table B.2: Stimulus list of 1+2 compounds. HF, LF, HR, and LR denote High Falling, Low Falling, High Rising, and Low Rising tones, respectively.

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
HF	HF	HF	新飞机	‘new airplane’
HF	HF	LF	灰姑娘	‘Cinderella’
HF	HF	HR	灰松鼠	‘gray squirrel’
HF	HF	LR	亲兄弟	‘biological brothers’
HF	LF	HF	新农村	‘new countryside’
HF	LF	LF	花门帘	‘floral door curtain’
HF	LF	HR	青苹果	‘green apple’
HF	LF	LR	鲜牛奶	‘fresh milk’
HF	HR	HF	新火车	‘new train’
HF	HR	LF	新广场	‘new square’
HF	HR	HR	新产品	‘new product’
HF	HR	LR	金拐杖	‘gold cane’
HF	LR	HF	金项圈	‘gold necklace’
HF	LR	LF	新礼堂	‘new auditorium’
HF	LR	HR	新市长	‘new mayor’
HF	LR	LR	亲父母	‘biological parents’
LF	HF	HF	霉千张	‘fermented tofu sheets’
LF	HF	LF	红蜻蜓	‘red dragonfly’
LF	HF	HR	甜糕点	‘sweet pastry’
LF	HF	LR	男经理	‘male manager’
LF	LF	HF	男明星	‘male celebrity’
LF	LF	LF	圆池塘	‘round pond’
LF	LF	HR	红苹果	‘red apple’
LF	LF	LR	男朋友	‘boyfriend’
LF	HR	HF	蓝水晶	‘blue crystal’
LF	HR	LF	蓝水壶	‘blue kettle’
LF	HR	HR	男厂长	‘male factory director’

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
LF	HR	LR	长拐杖	'long cane'
LF	LR	HF	红眼睛	'red eyes'
LF	LR	LF	圆肚皮	'round belly'
LF	LR	HR	男老板	'male boss'
LF	LR	LR	红玛瑙	'red agate'
HR	HF	HF	党中央	'Party central committee'
HR	HF	LF	手风琴	'accordion'
HR	HF	HR	小松鼠	'little squirrel'
HR	HF	LR	总经理	'general manager'
HR	LF	HF	小男生	'little boy'
HR	LF	LF	紫葡萄	'purple grapes'
HR	LF	HR	紫棉袄	'purple cotton jacket'
HR	LF	LR	小朋友	'little child'
HR	HR	HF	紫水晶	'purple crystal'
HR	HR	LF	小厂房	'small factory building'
HR	HR	HR	好手表	'good watch'
HR	HR	LR	好水稻	'good rice crop'
HR	LR	HF	肿眼泡	'puffy eyelids'
HR	LR	LF	小老头	'little old man'
HR	LR	HR	假户口	'fake household registration'
HR	LR	LR	假道士	'fake Taoist priest'
LR	HF	HF	老医生	'old doctor'
LR	HF	LF	老山羊	'old goat'
LR	HF	HR	老科长	'senior section chief'
LR	HF	LR	懒经理	'lazy manager'
LR	LF	HF	女明星	'female celebrity'
LR	LF	LF	老狐狸	'old fox'
LR	LF	HR	女团长	'female troupe leader'
LR	LF	LR	老朋友	'old friend'

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
LR	HR	HF	软饼干	'soft biscuit'
LR	HR	LF	老党员	'senior Party member'
LR	HR	HR	女厂长	'female factory director'
LR	HR	LR	母海马	'female seahorse'
LR	LR	HF	下眼泡	'lower eyelid'
LR	LR	LF	老丈人	'father-in-law'
LR	LR	HR	母老虎	'tigress'
LR	LR	LR	女导演	'female director'

APPENDIX C

Statistical results of the GAMM analyses in Chapter 3

This appendix contains the full tables with statistical results of the GAMM analyses reported in Chapter 3. Tables C.1 and C.2 show the statistical results of the analyses examining $\sigma 1$ register and contour on the f0 trajectories of trisyllabic compounds, corresponding to Table 3.2 in Chapter 3. Tables C.3 and C.4 show the results of the analyses examining the effects of $\sigma 2$ register and contour, corresponding to Table 3.3 in Chapter 3. Tables C.5 and C.6 show the results of the analyses examining the effects of $\sigma 3$ register and contour, corresponding to Table 3.4 in Chapter 3.

Table C.1: Smooth terms modelling the difference between trisyllabic compounds starting with High and Low register tones on $\sigma 1$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 1$ Register	edf	Ref.df	F value	p value	
F.HF.HF	H – L	3.902	4.798	39.973	< 0.001	***
F.HR.HF	H – L	3.841	5.007	18.994	< 0.001	***
F.LF.HF	H – L	4.551	5.864	18.518	< 0.001	***
F.LR.HF	H – L	1.213	1.400	23.017	< 0.001	***
F.HF.HR	H – L	3.053	3.996	19.913	< 0.001	***
F.HR.HR	H – L	3.035	3.981	51.910	< 0.001	***
F.LF.HR	H – L	5.993	7.377	9.324	< 0.001	***
F.LR.HR	H – L	6.536	7.851	10.433	< 0.001	***
F.HF.LF	H – L	6.990	8.340	21.604	< 0.001	***
F.HR.LF	H – L	6.150	7.497	16.610	< 0.001	***
F.LF.LF	H – L	8.209	9.344	16.405	< 0.001	***
F.LR.LF	H – L	2.825	3.702	30.259	< 0.001	***
F.HF.LR	H – L	2.641	3.448	23.862	< 0.001	***
F.HR.LR	H – L	3.825	4.969	23.789	< 0.001	***
F.LF.LR	H – L	2.269	2.957	25.883	< 0.001	***
F.LR.LR	H – L	5.943	7.326	25.745	< 0.001	***
R.HF.HF	H – L	5.209	6.462	26.713	< 0.001	***
R.HR.HF	H – L	8.858	9.633	25.260	< 0.001	***
R.LF.HF	H – L	7.600	8.920	42.833	< 0.001	***
R.LR.HF	H – L	8.230	9.266	88.011	< 0.001	***
R.HF.HR	H – L	6.870	8.012	15.567	< 0.001	***
R.HR.HR	H – L	5.007	6.386	23.966	< 0.001	***
R.LF.HR	H – L	6.985	8.299	22.268	< 0.001	***
R.LR.HR	H – L	8.084	9.138	19.365	< 0.001	***
R.HF.LF	H – L	5.683	6.932	43.293	< 0.001	***
R.HR.LF	H – L	4.352	5.572	26.053	< 0.001	***
R.LF.LF	H – L	5.689	7.037	19.707	< 0.001	***
R.LR.LF	H – L	6.890	8.187	23.380	< 0.001	***
R.HF.LR	H – L	5.513	6.797	22.115	< 0.001	***
R.HR.LR	H – L	5.804	7.218	20.725	< 0.001	***
R.LF.LR	H – L	5.613	6.958	13.140	< 0.001	***
R.LR.LR	H – L	4.326	5.537	25.884	< 0.001	***

Table C.2: Smooth terms modelling the difference between trisyllabic compounds starting with Falling and Rising tones on $\sigma 1$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 1$ Contour	edf	Ref.df	F value	p value	
H.HF.HF	F – R	8.959	9.766	14.120	< 0.001	***
H.HR.HF	F – R	7.943	8.729	13.555	< 0.001	***
H.LF.HF	F – R	8.599	8.932	27.141	< 0.001	***
H.LR.HF	F – R	9.479	9.866	19.297	< 0.001	***
H.HF.HR	F – R	9.268	9.824	13.927	< 0.001	***
H.HR.HR	F – R	9.382	9.873	12.922	< 0.001	***
H.LF.HR	F – R	8.217	8.804	13.204	< 0.001	***
H.LR.HR	F – R	9.640	9.942	22.257	< 0.001	***
H.HF.LF	F – R	9.011	9.728	13.533	< 0.001	***
H.HR.LF	F – R	7.759	8.621	12.328	< 0.001	***
H.LF.LF	F – R	9.243	9.819	12.777	< 0.001	***
H.LR.LF	F – R	8.027	9.138	5.689	< 0.001	***
H.HF.LR	F – R	8.618	9.588	9.404	< 0.001	***
H.HR.LR	F – R	7.610	8.516	10.478	< 0.001	***
H.LF.LR	F – R	7.818	8.709	16.937	< 0.001	***
H.LR.LR	F – R	7.976	8.756	16.242	< 0.001	***
L.HF.HF	F – R	7.893	8.661	13.113	< 0.001	***
L.HR.HF	F – R	8.361	8.839	19.523	< 0.001	***
L.LF.HF	F – R	8.447	8.870	26.777	< 0.001	***
L.LR.HF	F – R	9.557	9.901	26.823	< 0.001	***
L.HF.HR	F – R	7.939	8.711	13.262	< 0.001	***
L.HR.HR	F – R	9.298	9.849	20.403	< 0.001	***
L.LF.HR	F – R	8.445	8.889	28.032	< 0.001	***
L.LR.HR	F – R	8.470	8.879	25.889	< 0.001	***
L.HF.LF	F – R	8.957	9.685	13.267	< 0.001	***
L.HR.LF	F – R	7.590	8.496	8.736	< 0.001	***
L.LF.LF	F – R	9.442	9.867	34.284	< 0.001	***
L.LR.LF	F – R	9.386	9.850	17.211	< 0.001	***
L.HF.LR	F – R	8.896	9.671	15.197	< 0.001	***
L.HR.LR	F – R	8.210	8.796	18.035	< 0.001	***
L.LF.LR	F – R	7.592	8.515	10.173	< 0.001	***
L.LR.LR	F – R	8.888	9.632	15.265	< 0.001	***

Table C.3: Smooth terms modelling the difference between trisyllabic compounds with High and Low register tones on $\sigma 2$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 2$ Register	edf	Ref.df	F value	p value	
HF.F.HF	H – L	7.628	8.924	8.283	< 0.001	***
HR.F.HF	H – L	2.825	3.342	1.425	0.2289	
LF.F.HF	H – L	7.659	8.608	6.836	< 0.001	***
LR.F.HF	H – L	2.001	2.002	1.720	0.1792	
HF.F.HR	H – L	5.112	6.330	1.817	0.1059	
HR.F.HR	H – L	1.334	1.606	1.051	0.4812	
LF.F.HR	H – L	6.174	7.542	4.235	< 0.001	***
LR.F.HR	H – L	7.802	8.623	4.494	< 0.001	***
HF.F.LF	H – L	7.888	9.115	21.783	< 0.001	***
HR.F.LF	H – L	7.396	8.632	10.441	< 0.001	***
LF.F.LF	H – L	6.862	8.093	6.322	< 0.001	***
LR.F.LF	H – L	8.495	9.430	5.338	< 0.001	***
HF.F.LR	H – L	2.002	2.004	1.045	0.3518	
HR.F.LR	H – L	6.618	7.997	24.066	< 0.001	***
LF.F.LR	H – L	5.594	6.862	3.409	0.0016	**
LR.F.LR	H – L	6.216	7.474	4.363	< 0.001	***
HF.R.HF	H – L	7.126	8.296	4.508	< 0.001	***
HR.R.HF	H – L	8.178	8.752	6.554	< 0.001	***
LF.R.HF	H – L	7.553	8.551	5.364	< 0.001	***
LR.R.HF	H – L	4.114	5.062	8.346	< 0.001	***
HF.R.HR	H – L	7.112	8.298	2.471	0.0107	*
HR.R.HR	H – L	2.026	2.051	9.654	< 0.001	***
LF.R.HR	H – L	7.874	8.702	7.128	< 0.001	***
LR.R.HR	H – L	6.942	8.054	2.122	0.0268	*
HF.R.LF	H – L	1.002	1.004	2.158	0.1382	
HR.R.LF	H – L	4.189	5.142	2.449	0.0280	*
LF.R.LF	H – L	7.291	8.386	4.430	< 0.001	***
LR.R.LF	H – L	1.501	1.874	0.813	0.3960	
HF.R.LR	H – L	6.489	7.756	2.127	0.0344	*
HR.R.LR	H – L	3.430	4.469	4.828	< 0.001	***
LF.R.LR	H – L	6.280	7.623	2.675	0.0050	**
LR.R.LR	H – L	8.016	9.102	15.048	< 0.001	***

Table C.4: Smooth terms modelling the difference between trisyllabic compounds with Falling and Rising tones on $\sigma 2$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 2$ Contour	edf	Ref.df	F value	p value	
HF.H.HF	F – R	3.182	3.874	0.112	0.9810	
HR.H.HF	F – R	1.496	1.790	1.882	0.1730	
LF.H.HF	F – R	3.182	3.874	0.698	0.5781	
LR.H.HF	F – R	0.496	0.790	0.036	0.8669	
HF.H.HR	F – R	0.001	0.002	36226.207	< 0.001	***
HR.H.HR	F – R	3.229	3.893	0.179	0.9380	
LF.H.HR	F – R	1.001	1.002	0.139	0.7106	
LR.H.HR	F – R	3.229	3.893	0.396	0.8130	
HF.H.LF	F – R	1.323	1.546	0.167	0.8177	
HR.H.LF	F – R	1.002	1.004	8.871	0.0439	*
LF.H.LF	F – R	0.323	0.546	0.081	0.8338	
LR.H.LF	F – R	0.002	0.004	0.025	0.9916	
HF.H.LR	F – R	1.220	1.744	0.214	0.7178	
HR.H.LR	F – R	3.203	3.843	0.767	0.5622	
LF.H.LR	F – R	2.220	2.744	0.538	0.7141	
LR.H.LR	F – R	2.203	2.843	0.686	0.5090	
HF.L.HF	F – R	1.614	1.953	0.318	0.7209	
HR.L.HF	F – R	2.972	3.420	0.544	0.7297	
LF.L.HF	F – R	0.614	0.953	0.663	0.4268	
LR.L.HF	F – R	0.972	1.420	0.703	0.2788	
HF.L.HR	F – R	3.111	3.812	0.404	0.7822	
HR.L.HR	F – R	3.154	3.661	0.190	0.8849	
LF.L.HR	F – R	3.111	3.812	0.205	0.9187	
LR.L.HR	F – R	1.154	1.661	0.523	0.6169	
HF.L.LF	F – R	1.003	1.005	1.457	0.1256	
HR.L.LF	F – R	3.987	4.540	0.118	0.9866	
LF.L.LF	F – R	0.003	0.005	0.264	0.9701	
LR.L.LF	F – R	2.987	3.540	0.027	0.9973	
HF.L.LR	F – R	2.002	2.004	1.336	0.2609	
HR.L.LR	F – R	2.004	2.007	0.287	0.7500	
LF.L.LR	F – R	0.002	0.004	6.335	0.8810	
LR.L.LR	F – R	0.004	0.007	0.222	0.9683	

Table C.5: Smooth terms modelling the difference between trisyllabic compounds with High and Low register tones on $\sigma 3$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 3$ Register	edf	Ref.df	F value	p value	
HF.HF.F	H – L	2.001	2.002	26.241	< 0.001	***
HR.HF.F	H – L	1.040	1.079	2.589	0.0529	
LF.HF.F	H – L	2.018	2.035	0.259	0.7683	
LR.HF.F	H – L	2.001	2.002	2.576	0.0759	
HF.HR.F	H – L	8.115	9.247	43.686	< 0.001	***
HR.HR.F	H – L	8.441	9.400	17.009	< 0.001	***
LF.HR.F	H – L	3.211	3.880	0.847	0.4933	
LR.HR.F	H – L	4.380	5.408	2.466	0.0303	*
HF.LF.F	H – L	2.001	2.001	0.616	0.5402	
HR.LF.F	H – L	1.004	1.007	2.904	0.2025	
LF.LF.F	H – L	7.774	8.658	7.130	< 0.001	***
LR.LF.F	H – L	7.144	8.440	4.663	< 0.001	***
HF.LR.F	H – L	7.125	8.452	4.096	< 0.001	***
HR.LR.F	H – L	7.932	9.073	66.838	< 0.001	***
LF.LR.F	H – L	4.712	5.844	4.416	< 0.001	***
LR.LR.F	H – L	4.855	6.174	2.782	0.0112	*
HF.HF.R	H – L	2.001	2.003	1.544	0.2133	
HR.HF.R	H – L	2.001	2.002	1.286	0.2764	
LF.HF.R	H – L	1.001	1.002	1.003	0.2047	
LR.HF.R	H – L	2.486	2.851	0.209	0.8361	
HF.HR.R	H – L	8.101	9.226	11.475	< 0.001	***
HR.HR.R	H – L	4.632	5.857	2.077	0.0534	
LF.HR.R	H – L	1.008	1.017	15.594	< 0.001	***
LR.HR.R	H – L	1.006	1.013	4.471	0.0706	
HF.LF.R	H – L	3.596	4.678	2.722	0.0169	*
HR.LF.R	H – L	5.415	6.679	3.270	0.0074	**
LF.LF.R	H – L	7.390	8.668	3.294	< 0.001	***
LR.LF.R	H – L	4.052	4.981	1.987	0.0854	
HF.LR.R	H – L	8.953	9.720	5.554	< 0.001	***
HR.LR.R	H – L	5.050	6.358	1.981	0.0804	
LF.LR.R	H – L	2.002	2.005	5.295	0.0050	**
LR.LR.R	H – L	5.223	6.552	2.051	0.0509	

Table C.6: Smooth terms modelling the difference between trisyllabic compounds with Falling and Rising tones on $\sigma 3$.

$\sigma 1.\sigma 2.\sigma 3$	$\sigma 3$ Contour	edf	Ref.df	F value	p value	
HF.HF.H	F – R	2.001	2.003	19.473	< 0.001	***
HR.HF.H	F – R	1.634	1.973	0.002	0.9984	
LF.HF.H	F – R	0.001	0.003	0.135	0.9845	
LR.HF.H	F – R	0.634	0.974	0.316	0.5792	
HF.HR.H	F – R	1.950	2.401	0.420	0.6970	
HR.HR.H	F – R	0.219	0.387	4.563	0.1840	
LF.HR.H	F – R	0.950	1.401	0.849	0.4160	
LR.HR.H	F – R	1.219	1.387	1.127	0.4021	
HF.LF.H	F – R	1.357	1.596	0.012	0.9768	
HR.LF.H	F – R	1.426	1.693	0.192	0.7219	
LF.LF.H	F – R	0.357	0.596	0.097	0.8098	
LR.LF.H	F – R	0.426	0.693	0.242	0.6823	
HF.LR.H	F – R	0.643	0.993	0.138	0.7116	
HR.LR.H	F – R	2.272	2.811	0.233	0.8654	
LF.LR.H	F – R	1.643	1.993	0.200	0.8120	
LR.LR.H	F – R	1.272	1.811	0.762	0.3797	
HF.HF.L	F – R	1.001	1.001	0.078	0.6421	
HR.HF.L	F – R	1.001	1.002	6.094	0.0557	
LF.HF.L	F – R	0.001	0.001	0.154	0.9891	
LR.HF.L	F – R	0.001	0.002	0.013	0.9962	
HF.HR.L	F – R	2.923	3.575	0.086	0.9595	
HR.HR.L	F – R	2.976	3.620	1.198	0.4935	
LF.HR.L	F – R	1.923	2.575	0.149	0.9200	
LR.HR.L	F – R	1.976	2.620	0.405	0.5897	
HF.LF.L	F – R	1.001	1.003	1.875	0.1448	
HR.LF.L	F – R	1.447	1.719	0.301	0.7633	
LF.LF.L	F – R	0.001	0.003	0.044	0.9911	
LR.LF.L	F – R	0.447	0.719	0.328	0.6275	
HF.LR.L	F – R	2.015	2.481	0.019	0.9959	
HR.LR.L	F – R	2.987	3.652	0.324	0.8776	
LF.LR.L	F – R	1.015	1.481	0.143	0.8617	
LR.LR.L	F – R	1.987	2.652	0.380	0.7179	

APPENDIX D

Pilot study on quadri-syllabic compounds

This appendix presents the methods and preliminary results of a pilot study reported in Chapter 3. The pilot study aims to examine whether the sandhi contours of trisyllabic compounds can be similarly observed in longer sequences, specifically quadri-syllabic compounds.

D.1 Participants

10 native speakers of Shaoxing Wu who participated in the experiment of Chapter 3 also participated in this pilot study.

D.2 Stimuli

A list of quadrisyllabic compounds with 2+2 structure (e.g., $[[iŋ \quad n̩y] \quad [lɔ \quad sɿ]]$, ‘English teacher’) was constructed as the stimuli. Although 2+2 compounds might be realized in two disyllabic sandhi domains, where we cannot observe the intended quadrisyllabic sandhi patterns, previous studies suggest that

quadrissyllabic transliterated words or nonce words with no internal structure can be broken into two disyllabic sandhi domains as well (e.g., Y. Chen, 2008). The advantage of using 2+2 compounds is that they are more frequently used in daily life than transliterated words, and more natural to produce than nonce words.

To examine whether we can observe similar tonal melodies determined by the initial tone as in trissyllabic compounds, we varied the underlying tones of $\sigma 1$: for registers, both High and Low register tones were included; for contours, both Rising and Falling tones were included. Considering that the register of non-initial syllables can have subtle effects on the tonal realizations, we controlled the register of $\sigma 2$ and $\sigma 3$ as well, with both High and Low register tones included. Although non-initial contours seem to be neutralized in trissyllables, to confirm the findings in quadrissyllables, we still controlled for the underlying contours of $\sigma 2$ as Rising or Falling. As a result, the stimuli list consisted of 32 items ($2 \sigma 1$ tonal registers $\times 2 \sigma 1$ tonal contours $\times 2 \sigma 2$ tonal registers $\times 2 \sigma 2$ tonal contours $\times 2 \sigma 3$ tonal registers).

D.3 Procedure

The procedure was the same as the experiment of Chapter 3. In total, 320 tokens were collected (32 items $\times$ 10 speakers).

D.4 Data preparation and analysis

The sound files were listened to by a native speaker of Shaoxing Wu. 52 tokens were excluded due to disfluency or mistakes in production, resulting in 268 valid tokens. In addition, 61 tokens were clearly realized in two disyllabic sandhi domains rather than one, which is beyond the scope of this pilot study and excluded as well. In total, 207 tokens (77.2% of the valid tokens) were included for further analysis. They were manually segmented using Praat. f_0 values in Hz were extracted by taking ten equidistant points in the rime of each

syllable and normalized to within-speaker z-scores. Considering the limited number of tokens, we did not run statistical analysis but visualized the f_0 contours.

D.5 Preliminary results

F_0 trajectories of quadrisyllabic compounds starting with HF, LF, HR, and LR tones were plotted in Figure D.1. Line colors indicate the tonal category of σ_2 , and line types indicate the tonal register of σ_3 .

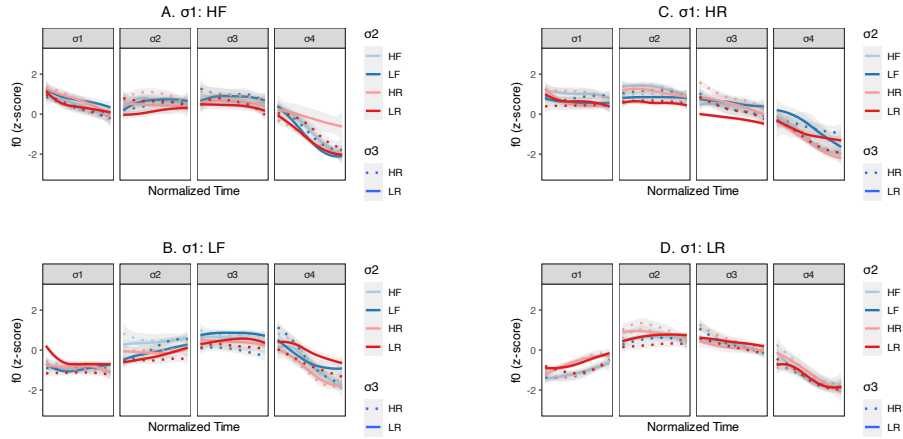


Figure D.1: f_0 trajectories of quadrisyllabic compounds undergoing the general pattern in Shaoxing Wu.

Similar to trisyllabic compounds, the underlying contour and register of σ_1 conditions the quadri-syllabic sandhi patterns (see more discussion in Section 3.4).

The underlying registers of non-initial syllables also condition the tonal realizations. For example, in quadri-syllables with underlying High register tones on σ_2 (light-colored lines), the f_0 of σ_2 starts higher than those with underlying Low register tones on σ_2 (dark-colored lines). Similar to trisyllabic compounds, register-induced variations are more discernible on σ_2 , especially when preceded by low tones.

The underlying contours of non-initial syllables (i.e., $\sigma 2$ in the current dataset) seem to be neutralized without conditioning sandhi patterns: quadrisyllables with underlying Falling (blue lines) and Rising (green lines) contours on $\sigma 2$ have similar f_0 trajectories. This echoes the findings in trisyllabic compounds where non-initial contours do not condition sandhi contours.

APPENDIX E

Stimulus list in Chapter 4

Table E.1: Stimulus list of disyllabic verb-object (VO) structures. HF, LF, HR, LR, HL, LL, HC and LC denote High Falling, Low Falling, High Rising, Low Rising, High Level, Low level, High Checked, Low checked tones, respectively.

$\sigma 1$	$\sigma 2$	Item 1		Item 2	
HF	HF	浇花	‘to water flowers’	开车	‘to drive a car’
HF	LF	低头	‘to lower one’s head’	关门	‘to close the door’
HF	HR	浇水	‘to water (plants)’	招手	‘to wave one’s hand’
HF	LR	收网	‘to haul in a net’	揩脸	‘to wipe one’s face’
HF	HL	开店	‘to open a shop’	烧菜	‘to cook dishes’
HF	LL	开会	‘to have a meeting’	烧饭	‘to cook rice’
HF	HC	烧粥	‘to cook porridge’	揩脚	‘to wipe one’s foot’
HF	LC	煎药	‘to brew medicine’	消毒	‘to disinfect’
LF	HF	磨刀	‘to sharpen a knife’	爬山	‘to climb a mountain’
LF	LF	抬头	‘to raise one’s head’	弹琴	‘to play the zither’

$\sigma 1$	$\sigma 2$	Item 1		Item 2	
LF	HR	防火	‘to prevent fires’	尝酒	‘to taste wine’
LF	LR	骑马	‘to ride a horse’	淘米	‘to rinse rice’
LF	HL	查账	‘to audit accounts’	裁布	‘to cut cloth’
LF	LL	流汗	‘to sweat’	寻路	‘to find the way’
LF	HC	流血	‘to bleed’	留客	‘to keep a guest’
LF	LC	骑鹿	‘to ride a deer’	搽药	‘to apply medicine’
HR	HF	纺纱	‘to spin yarn’	等车	‘to wait for a car’
HR	LF	锁门	‘to lock the door’	等人	‘to wait for someone’
HR	HR	煮酒	‘to warm wine’	举手	‘to raise one’s hand’
HR	LR	补网	‘to mend a net’	煮奶	‘to boil milk’
HR	HL	写信	‘to write a letter’	讲课	‘to give a lecture’
HR	LL	煮饭	‘to cook rice’	写字	‘to write characters’
HR	HC	煮粥	‘to cook porridge’	抖脚	‘to shake one’s foot’
HR	LC	炒肉	‘to stir-fry meat’	煮药	‘to boil medicine’
LR	HF	养鸡	‘to raise chickens’	买书	‘to buy books’
LR	LF	养牛	‘to raise cattle’	咬人	‘to bite people’
LR	HR	养狗	‘to raise dogs’	买酒	‘to buy wine’
LR	LR	买米	‘to buy rice’	养马	‘to raise horses’
LR	HL	买菜	‘to buy vegetables’	买布	‘to buy cloth’
LR	LL	养病	‘to recuperate’	买画	‘to buy paintings’
LR	HC	养鸭	‘to raise ducks’	买粥	‘to buy porridge’
LR	LC	买肉	‘to buy meat’	买玉	‘to buy jade’

Table E.2: Stimulus list of disyllabic subject-predicate (SP) structures. HF, LF, HR, LR, HL, LL, HC and LC denote High Falling, Low Falling, High Rising, Low Rising, High Level, Low level, High Checked, Low checked tones, respectively.

$\sigma 1$	$\sigma 2$	Item 1		Item 2	
HF	HF	山高	‘mountain (is) high’	汤鲜	‘soup (is) fresh’
HF	LF	天晴	‘sky (is) clear’	瓜甜	‘melon (is) sweet’
HF	HR	车稳	‘car (is) steady’	风小	‘wind (is) light’

$\sigma 1$	$\sigma 2$	Item 1	Item 2		
HF	LR	天冷	‘weather (is) cold’	天暖	‘weather (is) warm’
HF	HL	瓜脆	‘melon (is) crisp’	车破	‘car (is) broken’
HF	LL	风大	‘wind (is) strong’	车慢	‘car (is) slow’
HF	HC	天黑	‘sky (is) dark’	车黑	‘car (is) black’
HF	LC	书薄	‘book (is) thin’	瓜熟	‘melon (is) ripe’
LF	HF	楼高	‘building (is) tall’	人多	‘(there are) many people’
LF	LF	头圆	‘head (is) round’	牙黄	‘teeth (are) yellow’
LF	HR	人矮	‘person (is) short’	鞋小	‘shoes (are) small’
LF	LR	茶冷	‘tea (is) cold’	人懒	‘person (is) lazy’
LF	HL	人胖	‘person (is) fat’	皮脆	‘skin (is) crisp’
LF	LL	楼旧	‘building (is) old’	船慢	‘boat (is) slow’
LF	HC	柴湿	‘firewood (is) wet’	牙缺	‘tooth (is) chipped’
LF	LC	皮薄	‘skin (is) thin’	牙白	‘teeth (are) white’
HR	HF	水清	‘water (is) clear’	手酸	‘hand (is) sore’
HR	LF	手麻	‘hand (is) numb’	酒浓	‘wine (is) strong’
HR	HR	手巧	‘hand (is) skillful’	碗小	‘bowl (is) small’
HR	LR	水冷	‘water (is) cold’	手冷	‘hand (is) cold’
HR	HL	手痛	‘hand hurts’	伞破	‘umbrella (is) broken’
HR	LL	火旺	‘fire (is) strong’	手慢	‘hand (is) slow’
HR	HC	纸湿	‘paper (is) wet’	水急	‘the current (is) swift’
HR	LC	手滑	‘hand (is) slippery’	纸薄	‘paper (is) thin’
LR	HF	脸宽	‘face (is) wide’	礼多	‘gifts (are) abundant’
LR	LF	脸圆	‘face (is) round’	藕甜	‘lotus root (is) sweet’
LR	HR	雨小	‘rain (is) light’	脸短	‘face (is) short’
LR	LR	脸痒	‘face (is) itchy’	马懒	‘horse (is) lazy’
LR	HL	马瘦	‘horse (is) thin’	网破	‘net (is) broken’
LR	LL	脸大	‘face (is) big’	雨大	‘rain (is) heavy’
LR	HC	眼瞎	‘eye (is) blind’	雨急	‘rain (is) fierce’
LR	LC	脸白	‘face (is) pale’	米熟	‘rice (is) cooked’

Table E.3: Stimulus list of quadri-syllabic VO structures. HF, LF, HR and LR denote High Falling, Low Falling, High Rising and Low Rising tones, respectively.

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
HF	HF	HR	参观小区	‘to visit a residential community’
HF	HF	LR	参加舞会	‘to attend a dance party’
HF	LF	HR	安排酒店	‘to arrange a hotel’
HF	LF	LR	支持领导	‘to support the leader’
HF	HR	HR	分享饼干	‘to share cookies’
HF	HR	LR	邀请女生	‘to invite a girl’
HF	LR	HR	清理广场	‘to clean the square’
HF	LR	LR	招待老板	‘to host the boss’
LF	HF	HR	提高水平	‘to enhance the level’
LF	HF	LR	离开座位	‘to leave the seat’
LF	LF	HR	怀疑总统	‘to suspect the president’
LF	LF	LR	同情老板	‘to sympathize with the boss’
LF	HR	HR	提醒保姆	‘to remind the nanny’
LF	HR	LR	调整演员	‘to adjust the cast’
LF	LR	HR	传染小人	‘to infect a child’
LF	LR	LR	培养后代	‘to raise the next generation’
HR	HF	HR	指挥表演	‘to conduct a performance’
HR	HF	LR	改编舞蹈	‘to adapt a dance’
HR	LF	HR	保留指纹	‘to preserve fingerprints’
HR	LF	LR	检查卫生	‘to inspect hygiene’
HR	HR	HR	影响口碑	‘to influence reputation’
HR	HR	LR	采访领导	‘to interview the leader’
HR	LR	HR	整理口袋	‘to tidy a pocket’
HR	LR	LR	表演舞蹈	‘to perform a dance’
LR	HF	HR	理清感情	‘to sort out feelings’
LR	HF	LR	伪装老人	‘to disguise as an old person’

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item
LR	LF	HR	尾随小偷 ‘to follow a thief’
LR	LF	LR	远离社会 ‘to withdraw from society’
LR	HR	HR	了解品牌 ‘to learn about a brand’
LR	HR	LR	理解动机 ‘to understand motives’
LR	LR	HR	领养小人 ‘to adopt a child’
LR	LR	LR	领养女生 ‘to adopt a girl’

Table E.4: Stimulus list of quadri-syllabic SP structures. HF, LF, HR and LR denote High Falling, Low Falling, High Rising and Low Rising tones, respectively.

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item
HF	HF	HR	声音响亮 ‘sound (is) loud’
HF	HF	LR	医生伟大 ‘doctor (is) great’
HF	LF	HR	高楼整齐 ‘tall buildings (are) neat’
HF	LF	LR	蜻蜓有趣 ‘dragonfly (is) interesting’
HF	HR	HR	松鼠可爱 ‘squirrel (is) cute’
HF	HR	LR	科长懒惰 ‘section chief (is) lazy’
HF	LR	HR	兄弟爽快 ‘brother (is) straightforward’
HF	LR	LR	经理懒惰 ‘manager (is) lazy’
HF	HL	HR	功课简单 ‘homework (is) easy’
HF	HL	LR	钞票重要 ‘money (is) important’
HF	LL	HR	毡帽考究 ‘felt hat (is) elegant’
HF	LL	LR	希望渺茫 ‘hope (is) slim’
LF	HF	HR	房间整齐 ‘room (is) neat’
LF	HF	LR	来宾重要 ‘guest (is) important’
LF	LF	HR	蚊虫讨厌 ‘mosquitoes (are) annoying’
LF	LF	LR	平台重要 ‘platform (is) important’
LF	HR	HR	牙齿整齐 ‘teeth (are) neat’
LF	HR	LR	兰亭冷清 ‘Lanting (is) quiet’

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item	
LF	LR	HR	原理简单	'principle (is) simple'
LF	LR	LR	朋友重要	'friend (is) important'
LF	HL	HR	脾气爽快	'temper (is) straightforward'
LF	HL	LR	群众勇敢	'the people (are) brave'
LF	LL	HR	条件普通	'conditions (are) ordinary'
LF	LL	LR	强盗野蛮	'robber (is) barbaric'
HR	HF	HR	点心小巧	'snacks (are) delicate'
HR	HF	LR	隐私重要	'privacy (is) important'
HR	LF	HR	水平普通	'level (is) ordinary'
HR	LF	LR	沈园冷清	'Shen's Garden (is) quiet'
HR	HR	HR	产品考究	'product (is) refined'
HR	HR	LR	保险重要	'insurance (is) important'
HR	LR	HR	展览火爆	'exhibition (is) popular'
HR	LR	LR	水稻重要	'rice (is) important'
HR	HL	HR	广告简单	'advertisement (is) simple'
HR	HL	LR	广告有趣	'advertisement (is) interesting'
HR	LL	HR	草帽考究	'straw hat (is) well-crafted'
HR	LL	LR	表现领先	'performance (is) leading'
LR	HF	HR	项圈考究	'collar (is) elegant'
LR	HF	LR	雨衣有趣	'raincoat (is) interesting'
LR	LF	HR	市场稳定	'market (is) stable'
LR	LF	LR	礼堂冷清	'auditorium (is) quiet'
LR	HR	HR	老板小气	'boss (is) stingy'
LR	HR	LR	户口重要	'household registration (is) important'
LR	LR	HR	道理简单	'principle (is) simple'
LR	LR	LR	领导满意	'leader (is) satisfied'
LR	HL	HR	纽扣小巧	'button (is) delicate'
LR	HL	LR	武器重要	'weapon (is) important'
LR	LL	HR	社会稳定	'society (is) stable'

$\sigma 1$	$\sigma 2$	$\sigma 3$	Item
LR	LL	LR	项链老气 ‘necklace (is) old-fashioned’