

ARTICLE

Children's preferences for virtual agents with natural and synthetic voices: Exploring developmental differences in willingness to interact and perceived voice quality

Supplementary Files



Figure S1. Frames extracted from the original video stimuli showing the four human agents (male adult, female adult, male child, and female child) used in the study. All figures are original and were created by the authors for this study. The images of the human agents are video frames extracted from original recordings produced by the research team

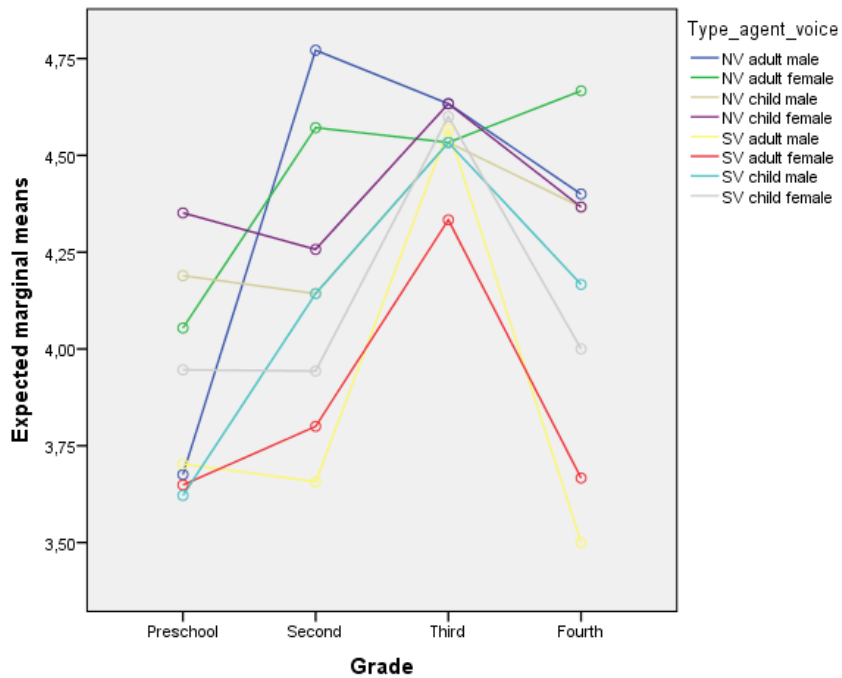


Figure S2. Estimated marginal means of willingness to interact across participant grades for each agent type
Abbreviations: NV: Natural voice; SV: Synthetic voice.

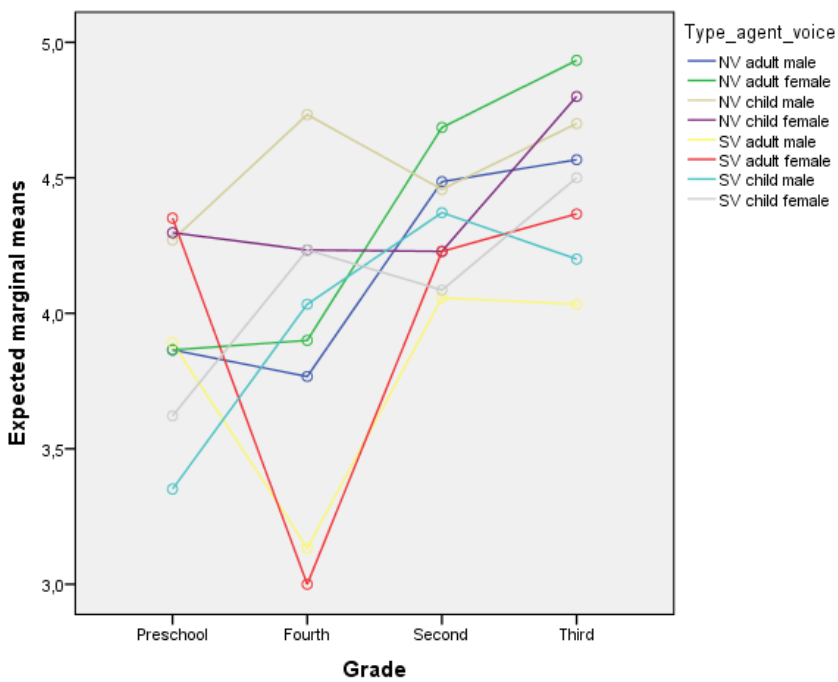


Figure S3. Estimated marginal means of quality of voices (clear and understandable language) across participant grades for each agent type
Abbreviations: NV: Natural voice; SV: Synthetic voice.

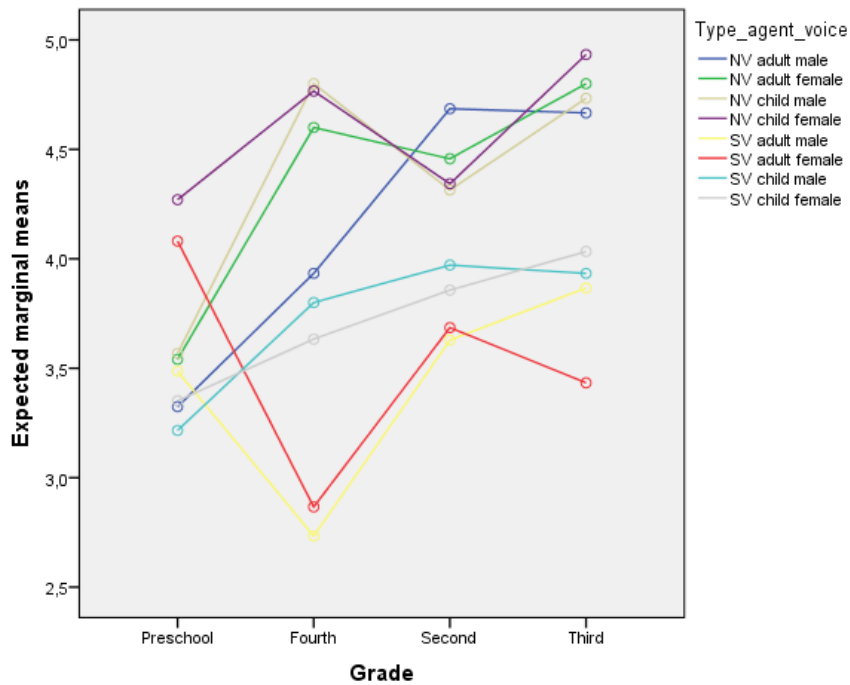


Figure S4. Estimated marginal means of quality of voice (strange way of speaking) across participant grades for each agent type
Abbreviations: NV: Natural voice; SV: Synthetic voice.

Table S1. Descriptive statistics (mean and standard deviation) for willingness to interact across agent conditions

Agent	N	Min	Max	Means	SD
Male adult NV	132	1.0	5.0	4.348	1.2293
Female adult NV	132	1.0	5.0	4.439	1.2185
Male child NV	132	1.0	5.0	4.295	1.3800
Female child NV	132	1.0	5.0	4.386	1.2084
Male adult SV	132	1.0	5.0	3.848	1.6275
Female adult SV	132	1.0	5.0	3.848	1.5653
Male child SV	132	1.0	5.0	4.091	1.3673
Female child SV	132	1.0	5.0	4.106	1.3606
Valid cases (listwise)	132				

Abbreviations: NV: Natural voice; SV: Synthetic voice.

Table S2. Internal consistency of the quality-of-voice scale (Cronbach’s α)

Measure	Value
Valid N	132
Excluded (missing)	0
Number of items	2
Cronbach’s alpha	0.503

Table S3. Estimated marginal means of willingness to interact by participant grade

Grade	M	SD
Preschool	3.890	0.132
Second	4.159	0.134
Third	4.534	0.150
Fourth	4.131	0.145

Table S4. Estimated marginal means of willingness to interact by agent type

Agent type	M	SD
Male adult NV	4.370	0.104
Female adult NV	4.474	0.107
Male child NV	4.289	0.120
Female child NV	4.389	0.107
Male adult SV	3.820	0.139
Female adult SV	3.873	0.139
Male child SV	4.096	0.120
Female child SV	4.117	0.120

Table S5. Estimated marginal means of willingness to interact showing participant gender × agent type interactions

Gender	Agent type	M	SD
Female	Male adult NV	4.331	0.156
	Female adult NV	4.625	0.159
	Male child NV	4.004	0.180
	Female child NV	4.391	0.159
	Male adult SV	3.470	0.207
	Female adult SV	3.902	0.208
	Male child SV	4.039	0.179
	Female child SV	4.230	0.179
Male	Male adult NV	4.409	0.138
	Female adult NV	4.322	0.142
	Male child NV	4.573	0.160
	Female child NV	4.386	0.142
	Male adult SV	4.170	0.184
	Female adult SV	3.844	0.185
	Male child SV	4.154	0.159
	Female child SV	4.004	0.159

Table S6. Estimated marginal means of quality of voice (clear and understandable language) by participant grade

Grade	M	SD
Preschool	3.932	0.124
Second	4.325	0.127
Third	4.476	0.142
Fourth	3.892	0.137

Table S7. Estimated marginal means of quality of voice (clear and understandable language) by agent type

Agent type	M	SD
Male adult NV	4.170	0.122
Female adult NV	4.336	0.105
Male child NV	4.532	0.090
Female child NV	4.373	0.102
Male adult SV	3.770	0.138
Female adult SV	3.948	0.122
Male child SV	4.001	0.111
Female child SV	4.122	0.119

Table S8. Estimated marginal means of quality of voice (clear and understandable language) showing participant grade × agent type interactions

Grade	Agent type	M	SD
Preschool	Male adult NV	3.836	0.228
	Female adult NV	3.821	0.197
	Male child NV	4.238	0.168
	Female child NV	4.262	0.191
	Male adult SV	3.882	0.259
	Female adult SV	4.354	0.228
	Male child SV	3.406	0.208
	Female child SV	3.659	0.223
Second	Male adult NV	4.490	0.232
	Female adult NV	4.688	0.201
	Male child NV	4.467	0.171
	Female child NV	4.232	0.195
	Male adult SV	4.057	0.264
	Female adult SV	4.221	0.232
	Male child SV	4.366	0.212
	Female child SV	4.078	0.228

(Cont'd...)

Table S8. *Continued*

Grade	Agent type	M	SD
Third	Male adult NV	4.562	0.260
	Female adult NV	4.947	0.225
	Male child NV	4.687	0.192
	Female child NV	4.766	0.218
	Male adult SV	3.969	0.296
	Female adult SV	4.194	0.260
	Male child SV	4.196	0.238
	Female child SV	4.490	0.255
Fourth	Male adult NV	3.790	0.251
	Female adult NV	3.888	0.218
	Male child NV	4.737	0.186
	Female child NV	4.232	0.211
	Male adult SV	3.170	0.286
	Female adult SV	3.022	0.251
	Male child SV	4.036	0.230
	Female child SV	4.259	0.246

Table S9. Estimated marginal means of quality of voice (strange way of speaking) by participant grade

Grade	M	SD
Preschool	3.642	0.146
Second	4.116	0.149
Third	4.299	0.167
Fourth	3.905	0.161

Table S10. Estimated marginal means of quality of voice (strange way of speaking) by agent type

Agent type	M	SD
Male adult NV	4.164	0.127
Female adult NV	4.359	0.113
Male child NV	4.367	0.112
Female child NV	4.595	0.096
Male adult SV	3.430	0.150
Female adult SV	3.490	0.146
Male child SV	3.758	0.147
Female child SV	3.761	0.148

Table S11. Estimated marginal means of quality of voice (strange way of speaking) showing participant grade × agent type interactions

Grade	Agent type	M	SD
Preschool	Male adult NV	3.330	0.238
	Female adult NV	3.536	0.212
	Male child NV	3.664	0.210
	Female child NV	4.320	0.180
	Male adult SV	3.496	0.281
	Female adult SV	4.101	0.274
	Male child SV	3.265	0.276
	Female child SV	3.429	0.277
Second	Male adult NV	4.690	0.242
	Female adult NV	4.456	0.216
	Male child NV	4.327	0.214
	Female child NV	4.348	0.184
	Male adult SV	3.618	0.286
	Female adult SV	3.676	0.279
	Male child SV	3.958	0.281
	Female child SV	3.859	0.283
Third	Male adult NV	4.699	0.272
	Female adult NV	4.842	0.242
	Male child NV	4.694	0.240
	Female child NV	4.947	0.206
	Male adult SV	3.818	0.320
	Female adult SV	3.304	0.312
	Male child SV	3.986	0.315
	Female child SV	4.103	0.317
Fourth	Male adult NV	3.938	0.262
	Female adult NV	4.603	0.234
	Male child NV	4.786	0.231
	Female child NV	4.763	0.199
	Male adult SV	2.790	0.310
	Female adult SV	2.879	0.302
	Male child SV	3.826	0.304
	Female child SV	3.652	0.306