

Evaluating US Smokers' **Willingness to Pay** for Different Cigarette Packaging Designs Before and After Real-world Exposure in a Randomised Trial



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Tobacco Online Policy Seminar

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Citation

Original research

Evaluating US smokers' willingness to pay for different cigarette packaging designs before and after real-world exposure in a randomised trial

 Matthew Stone¹, Claudiu Dimofte², David Strong^{3, 4},  Kim Pulvers⁵, Noe C Crespo⁶, Eric C Leas^{3, 4},  John P Pierce^{3, 4}

16,000,000 Diseased

Americans resulting from cigarette smoking

\$300 Billion in Annual Costs

due to medical care are lost productivity

480,000 Deaths Per Year

within the United States are attributed to cigarette smoking



The Tobacco Epidemic: A Global Treaty

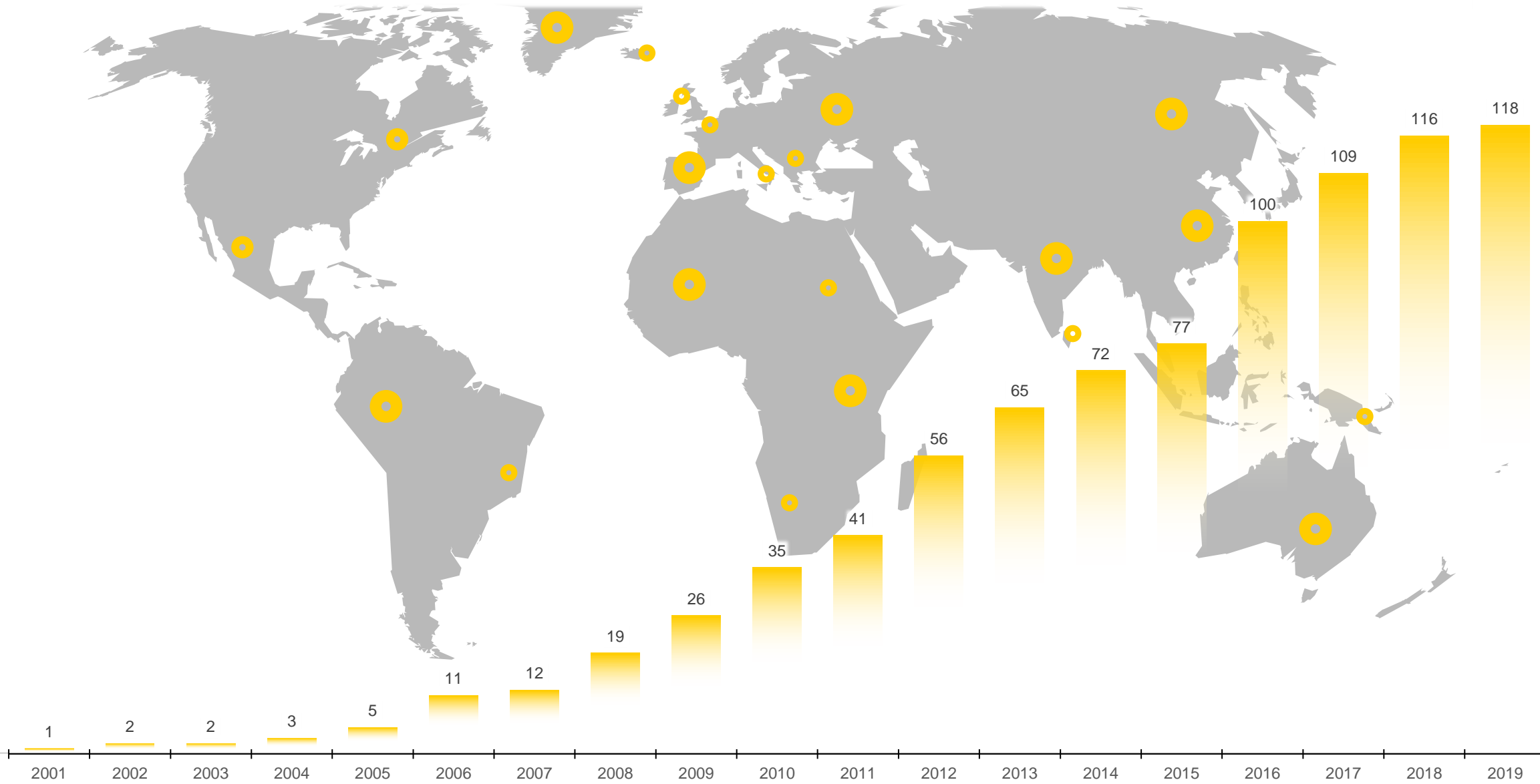
WHO's Framework Convention on Tobacco Control (FCTC)

- 2003 global treaty put forth to combat the rising tobacco epidemic
- Article 11 of this treaty set out to ensure that...

...every person be informed of the health consequences, addictive nature and mortal threat posed by tobacco consumption and exposure to tobacco smoke

- Recommended large health warning labels for all products
- Strongly recommended Graphic Health Warnings Labels (GWLs)
- 182 countries ratified FCTC, but not the United States (US)

Graphic Health Warnings: A Global Treaty





What's the **Background?**

Family Smoking Prevention and **Tobacco Control Act**

- June 2009 – Enacted by Congress
- Gave the FDA the regulatory authority over all tobacco products
- Including:
 - Manufacturing
 - Distribution
 - Marketing
- Also, required FDA to mandate graphic warning labels
- A GWL rule was proposed in 2011

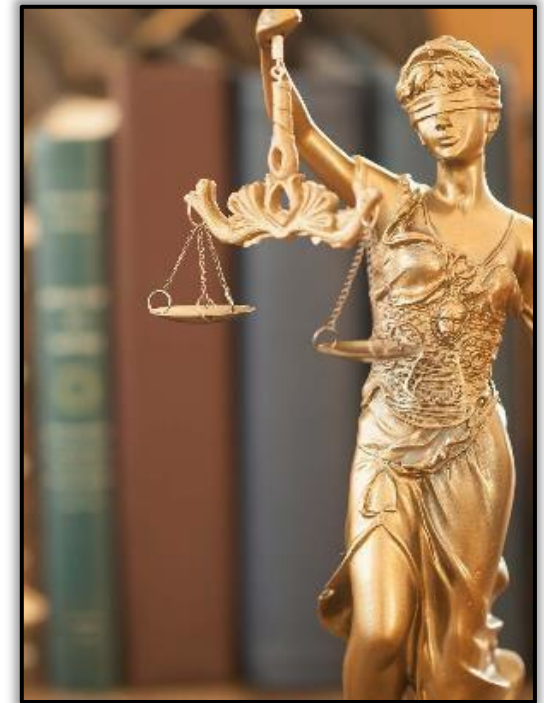




What's the **Background?**

Tobacco Control Act and Graphic Requirement Court Battles

- 2009 – Industry lawsuit against the Tobacco Control Act
Deemed the Act as constitutional
US Supreme Court denied industry appeal
- 2011 – Second Industry lawsuit against graphic labels
GWLs struck down on first amendment grounds
- 2019 – Public health groups lawsuit filed against FDA
Ruled to require the warnings
- 2020 – FDA new rule
Third lawsuit against the Tobacco Control Act
Effective date October 6th, 2023



Cigarette Packaging Contains Marketing



Removal of Cigarette Pack Marketing





Impact of Graphic Warnings on Price Perceptions

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Research paper

Estimating the 'consumer surplus' for branded versus standardised tobacco packaging

[Philip Gendall](#)¹, [Christine Eckert](#)², [Janet Hoek](#)¹, [Tessa Far](#)
[Richard Edwards](#)⁴

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Original research

Tool to assess appeal–aversion response to graphic warning labels on cigarette packs among US smokers

[Matthew D Stone](#)^{1, 2}, [Claudiu V Dimofte](#)³, [David R Strong](#)^{1, 2}, [Adriana Villasenor](#)^{1, 2}, [Kim Pulvers](#)⁴, [Karen Messer](#)^{1, 2}, [John P Pierce](#)^{1, 2}

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Approach

California Smokers in Australia (CASA): **A Randomised Controlled Trial**

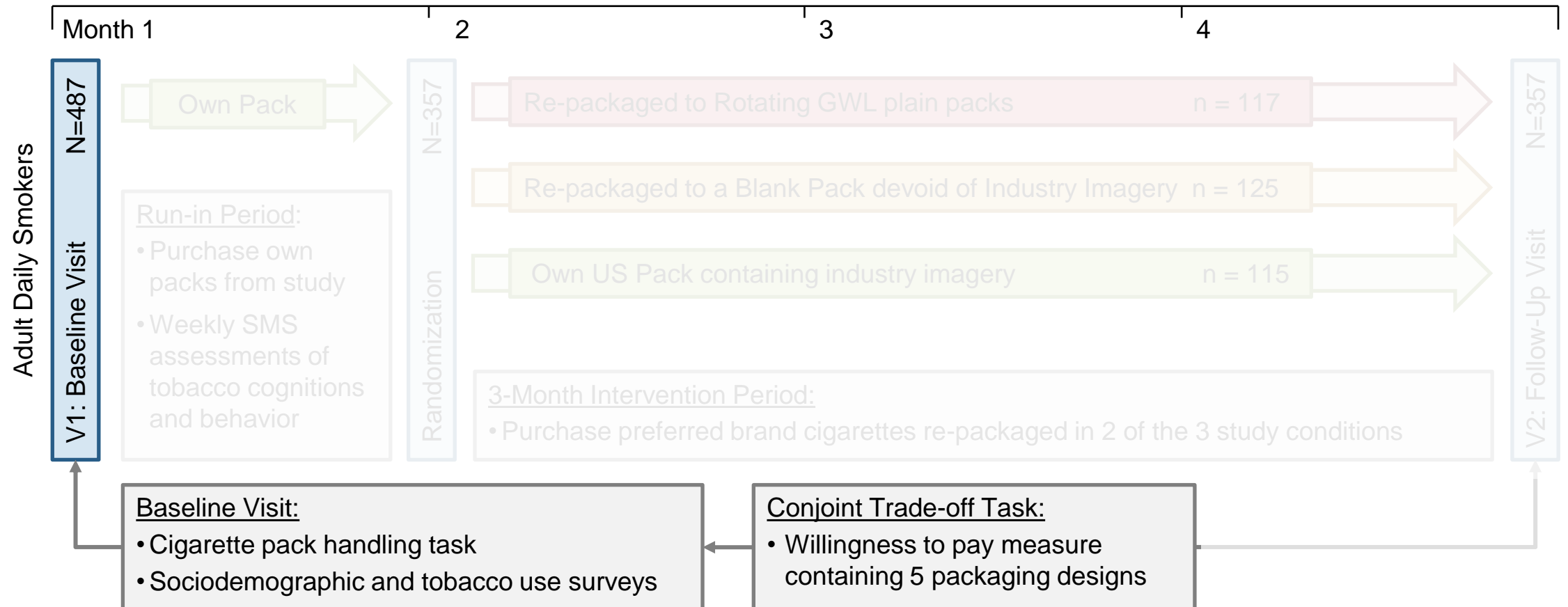
- Examined the effects packaging has on smoking cognitions and behavior
- Obtained license for 8 images used in Australia and selected 3 to rotate on repackaging of US smokers' own cigarettes
- Adaptive choice-based conjoint task included at baseline and follow-up
- Explored US smokers' willingness to pay for different cigarette packaging options following initial exposure and 3-month experience of having their cigarettes repackaged with these options





CASA: Randomized Trial Design

Effect of Packaging on Smoking Perceptions and Behavior: R01-CA190347





CASA Sample Characteristics: N=357

Variable	n (%) or Mean (SD)		Variable	n (%) or Mean (SD)	
Age	39.08	11.90	Cigarettes per Day	11.65	5.92
Gender			Primary Brand Smoked		
Male	162	45.4%	American Spirit	65	18.2%
Female	195	54.6%	Camel	94	26.3%
Race/Ethnicity			Marlboro	148	41.5%
Hispanic	40	11.2%	Newport	15	4.2%
White, Non-Hispanic	243	68.1%	Other	35	9.8%
Other, Non-Hispanic	74	20.7%	Brand Loyal		
Education			Yes	269	75.4%
High school or less	41	11.5%	No	88	24.6%
Some college	168	47.1%	Comparative Brand Perceptions		
College degree	148	41.4%	Harshness	2.41	1.29
Income			Healthiness	4.81	1.46
Less than \$24,999	66	18.5%	Affordability	4.47	1.60
\$25,000 to \$49,999	77	21.6%	Nicotine Dependence (FTND)	3.81	2.28
\$50,000 to \$99,999	73	20.4%	Health Anxiety	1.13	0.87
\$100,000 or more	44	12.3%	Psychological Distress (K6)	0.98	0.74
Not asked	97	27.2%	Sensation Seeking (BSSS)	1.88	0.67



Internal Consistency and Scalability

N	Alpha	Omega	Coef H	Range
1	-	-	-	1-6
1	-	-	-	1-6
1	-	-	-	1-6
6	.67	.59	.39	0-10
7	.86	.81	.52	0-4
6	.86	.71	.57	0-4
4	.80	.77	.59	0-3



Approach: A Willingness to Pay Purchase Task

Adaptive Choice-Based Conjoint Analysis

A discrete-choice task determined the implicit valuations attributed to various cigarette pack attributes and their corresponding levels →

Identifies how important an attribute is when deciding to purchase a product and partitions off the utility of each attribute level

An Adaptive Fractional Factorial Design

- “Build Your Own” (BYO) product questionnaire
- A series of products sets which vary 1 to 2 attributes were presented alongside varied cigarette pack prices
- Product choices were made until clear preferences were identified

<i>Attribute</i>	<i>Level</i>
Pack Design	Gangrene
	Teeth damage
	Blindness
	Blank
	Current US
Tobacco Origin	Domestic
	Imported
Quitline Number	Present
	Absent
Price	±33% of pack \$



Adaptive Fractional Factorial Design

Table 2. Conjoint Test Design Report for 1000 Simulated Respondents Answering the ACBC Questions Randomly

Bot ID	Packaging					Quitline		Tobacco origin		Price				D-Efficiency
	US	Blank	Blindness	Teeth	Gangrene	Absent	Present	Domestic	Imported	-33% to -16.5%	-16.5% to 0%	0% to 16.5%	16.5% to 33%	
1	3	3	3	3	3	6	9	6	9	3	4	4	4	0.81936
2	3	3	3	3	3	6	9	9	6	4	4	4	3	0.89746
3	3	3	3	3	3	6	9	9	6	3	4	4	4	0.85349
4	3	3	3	3	3	6	9	6	9	3	4	4	4	0.77914
5	3	3	3	3	3	9	6	9	6	3	4	4	4	0.86924
6	3	3	3	3	3	6	9	9	6	4	4	4	3	0.85771
7	3	3	3	3	3	9	6	9	6	3	4	4	4	0.88580
8	3	3	3	3	3	6	9	9	6	3	4	4	4	0.89746
9	3	3	3	3	3	9	6	6	9	3	4	4	4	0.84533
10	3	3	3	3	3	9	6	6	9	3	4	4	4	0.83947
11	3	3	3	3	3	6	9	9	6	3	4	4	4	0.85945
12	3	3	3	3	3	6	9	6	9	3	4	4	4	0.83778
13	3	3	3	3	3	6	9	9	6	4	3	4	4	0.76329
14	3	3	3	3	3	6	9	9	6	4	3	4	4	0.77355
15	3	3	3	3	3	6	9	6	9	5	3	3	4	0.77448
16	3	3	3	3	3	9	6	6	9	4	4	4	3	0.80358
17	3	3	3	3	3	6	9	9	6	4	4	4	3	0.78556
18	3	3	3	3	3	9	6	6	9	4	4	4	3	0.87953
19	3	3	3	3	3	9	6	6	9	3	4	4	4	0.75316
20	3	3	3	3	3	6	9	9	6	3	4	4	4	0.82936
...														
1000	3	3	3	3	3	9	6	6	9	3	4	4	4	0.84129



Conjoint Analysis: A Willingness to Pay Purchase Task

Please remind us what brand of cigarettes you usually smoke.

(please select the main brand out of the choices below and ignore the sub-brands; for example, if you smoke Marlboro Lights please select Marlboro as your brand)

☐ American Spirit

☐ Camel

☒ Marlboro

☐ Newport

☐ Other

What is the average price you pay for a pack of cigarettes (including tax)?

(please insert numbers only, with decimals if needed: for example 7.95)



Conjoint Analysis: A Willingness to Pay Purchase Task

In this task, please create your own cigarette pack.

To start, select one option from each feature to create the pack (it will be displayed on the right side of the screen).

Feel free to change the options until you are satisfied with the final product (i.e., you have created your preferred pack).

When you are done, please click the arrow to continue.

Feature	Select One Option
Design	<input checked="" type="radio"/> Marketing branded pack <input type="radio"/> Plain pack (generic color, no graphic image) <input type="radio"/> Pack featuring slightly graphic image (blindness danger) <input type="radio"/> Pack featuring moderately graphic image (teeth damage danger) <input type="radio"/> Pack featuring highly graphic image (foot gangrene danger)
Toll free quitline phone number	<input checked="" type="radio"/> No toll free quitline phone number listed <input type="radio"/> Toll free quitline phone number listed
Tobacco Source	<input checked="" type="radio"/> Domestic tobacco <input type="radio"/> Imported tobacco





Conjoint Analysis: A Willingness to Pay Purchase Task

Question
1 of 9

		
Marketing branded pack	Blank pack	Graphic image pack
Toll free Quitline listed	Toll free Quitline listed	No Quitline listed
Imported tobacco	Domestic tobacco	Imported tobacco
\$8.49	\$11.38	\$7.65
<div><input type="checkbox"/> Would possibly buy</div> <div><input checked="" type="checkbox"/> Would not buy</div>	<div><input checked="" type="checkbox"/> Would possibly buy</div> <div><input type="checkbox"/> Would not buy</div>	<div><input type="checkbox"/> Would possibly buy</div> <div><input checked="" type="checkbox"/> Would not buy</div>

Design
Quitline number
Tobacco origin
Price



Conjoint Analysis: A Willingness to Pay Purchase Task

Question
2 of 9

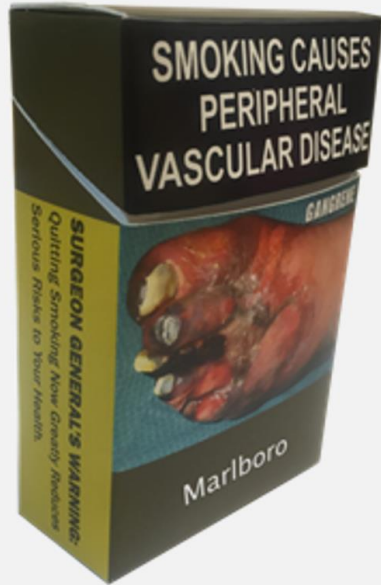

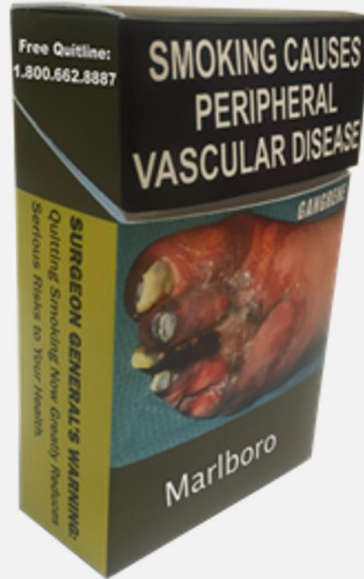
		
Graphic image pack	Marketing branded pack	Blank pack
Toll free Quitline listed	Toll free Quitline listed	No Quitline listed
Domestic tobacco	Domestic tobacco	Imported tobacco
\$11.44	\$12.05	\$8.78
<div><input type="checkbox"/> Would possibly buy</div> <div><input checked="" type="checkbox"/> Would not buy</div>	<div><input type="checkbox"/> Would possibly buy</div> <div><input checked="" type="checkbox"/> Would not buy</div>	<div><input checked="" type="checkbox"/> Would possibly buy</div> <div><input type="checkbox"/> Would not buy</div>

Design
Quitline number
Tobacco origin
Price



Conjoint Analysis: A Willingness to Pay Purchase Task

Question
3 of 9

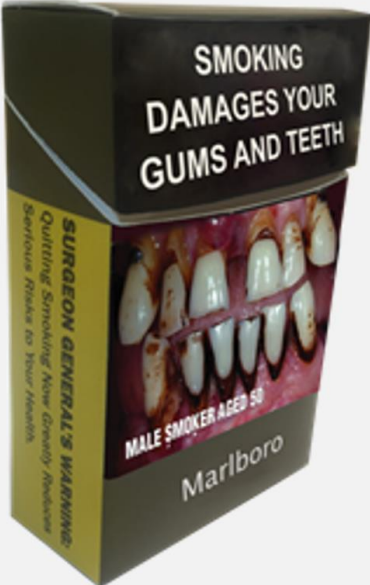


		
Graphic image pack	Graphic image pack	Graphic image pack
No Quitline listed	No Quitline listed	Toll free Quitline listed
Imported tobacco	Imported tobacco	Domestic tobacco
\$11.83	\$7.47	\$6.84
<div><input type="checkbox"/> Would possibly buy</div> <div><input checked="" type="checkbox"/> Would not buy</div>	<div><input checked="" type="checkbox"/> Would possibly buy</div> <div><input type="checkbox"/> Would not buy</div>	<div><input checked="" type="checkbox"/> Would possibly buy</div> <div><input type="checkbox"/> Would not buy</div>

Design
Quitline number
Tobacco origin
Price



Conjoint Analysis: A Willingness to Pay Purchase Task

Question
1 of up to 9

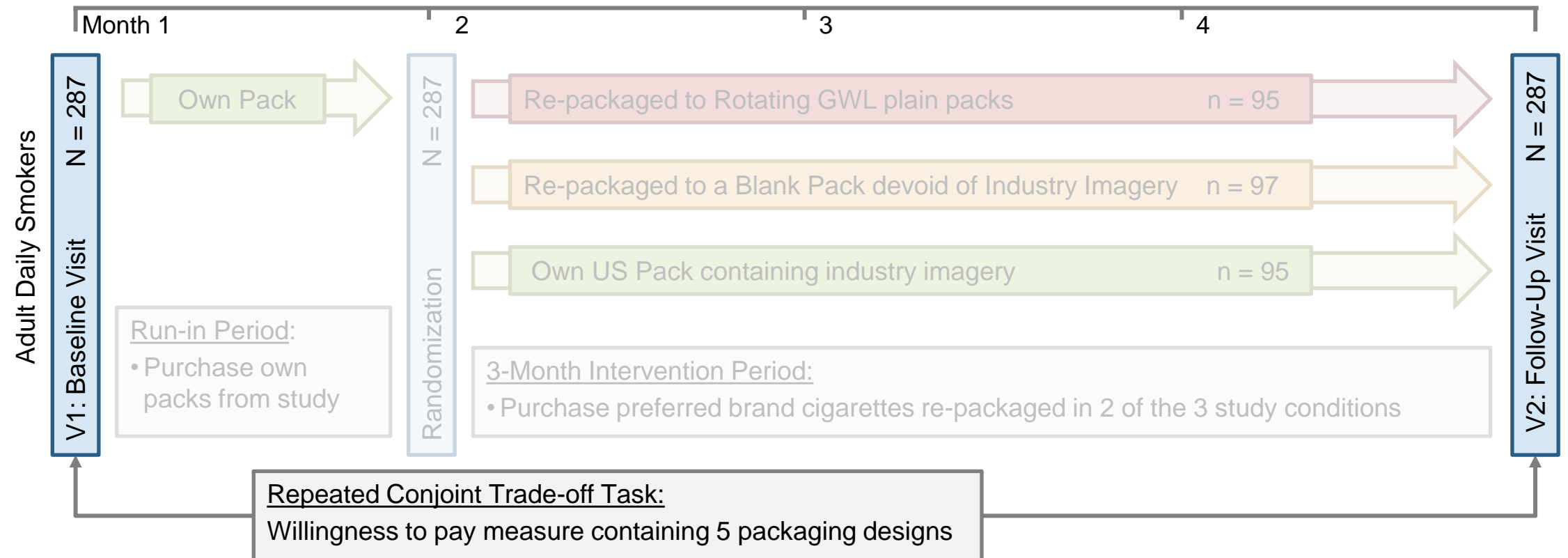
		
Graphic image pack	Blank Pack	Graphic image pack
No Quitline listed	No Quitline listed	No Quitline listed
Domestic tobacco	Domestic tobacco	Domestic tobacco
\$7.47	\$8.78	\$7.65
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Design
Quitline number
Tobacco origin
Price
Select one



Study Design

Figure 1. Change in Willingness to Pay Assessment after 3-month Exposure to Differing Packaging Design Options



CONJOINT TASK



INTERVENTION



CONJOINT TASK



& INTERVENTION



Any questions ?



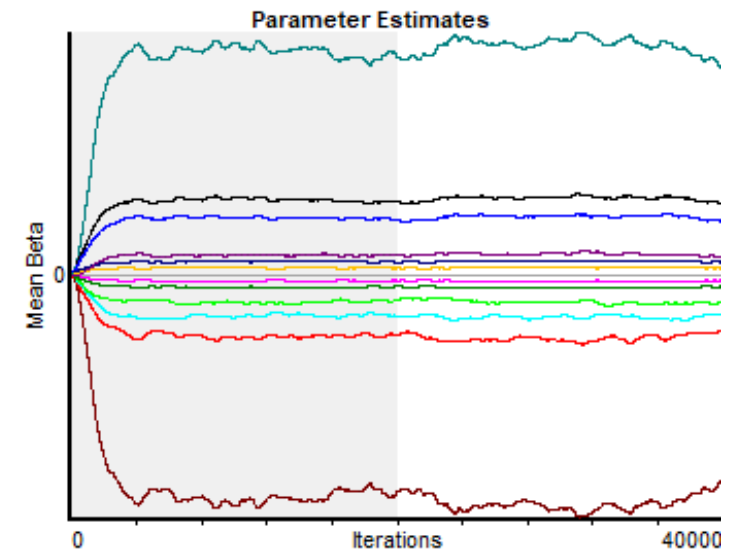
Conjoint Analysis

Attribute Level Utility and Willingness to Pay

Multinomial logit hierarchical Bayesian estimation determined the utility of product attribute levels using 40,000 iterative models

This allows the implicit value (utilities) of the individual product characteristics to be determined

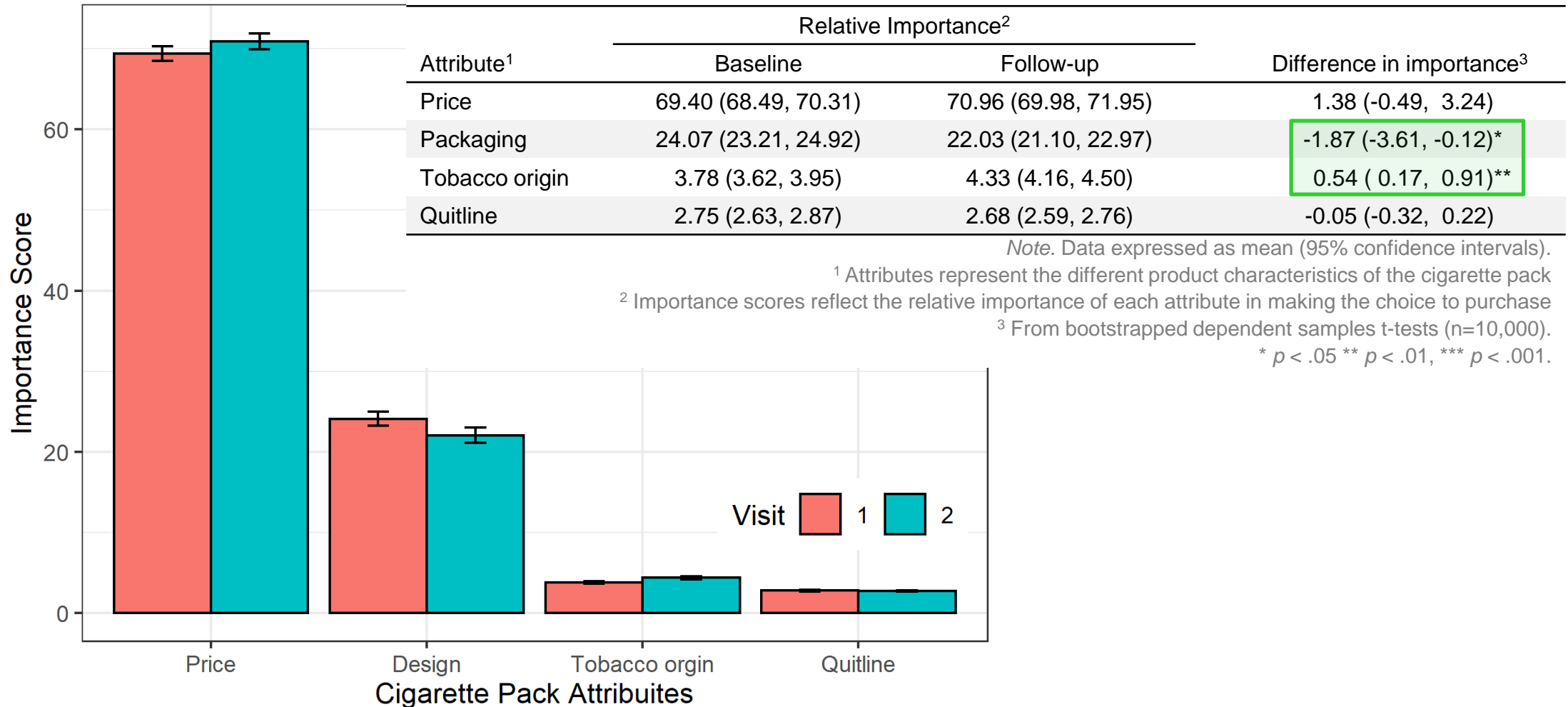
- These utilities represent a relative weighted preference for each attribute level
- Dollar per utility were derived and willingness to pay valuations calculated
- Attribute importance scores then derived





Change in **Relative Importance** of Pack Attributes

Table 3.1 Change in Cigarette Pack Attribute Importance after 3-month Packaging Invention (N=287)





Unadjusted Change in Willingness to Pay by Trial Arm

Table 3.2 Change in Price Utilities of Cigarette Pack Designs by Intervention Arm among Daily Smokers

Packaging attribute level	US Branded Pack Arm		Blank Pack Arm		GWL Pack Arm	
	Baseline price utility ¹	Change ² in price utility at V2	Baseline price utility ¹	Change ² in price utility at V2	Baseline price utility ¹	Change ² in price utility at V2
	(N = 95)	Δ (95%CI)	(N = 97)	Δ (95%CI)	(N = 95)	Δ (95%CI)
Current US	\$1.92	-\$0.02 (-0.28, 0.24)	\$2.22	-\$0.46 (-0.77, -0.13)**	\$1.69	-\$0.27 (-0.52, -0.03)*
Blank	\$1.51	\$0.13 (-0.11, 0.37)	\$1.81	-\$0.22 (-0.51, 0.07)	\$1.35	-\$0.06 (-0.30, 0.20)
Blindness	-\$0.80	\$0.11 (-0.04, 0.25)	-\$0.74	-\$0.02 (-0.18, 0.14)	-\$0.65	\$0.05 (-0.11, 0.20)
Teeth damage	-\$1.03	-\$0.26 (-0.46, -0.07)*	-\$1.24	\$0.01 (-0.24, 0.24)	-\$0.88	-\$0.20 (-0.40, -0.01)*
Gangrene	-\$1.60	\$0.05 (-0.18, 0.28)	-\$2.06	\$0.69 (0.42, 0.97)***	-\$1.52	\$0.49 (0.26, 0.72)***

Note. N=287. Abbreviations: V1, Visit 1; V2, Visit 2. Data expressed as Mean or Mean Δ (95% confidence intervals).

¹ Utility scores represent the preference for each packaging design and dollar valuation associated with that preference, with positive values indicating a relative willingness to pay more for the packaging and negative values representing the discount needed to purchase the packaging.

² From bootstrapped dependent samples t-tests (n=10,000).

* p < .05 ** p < .01, *** p < .001

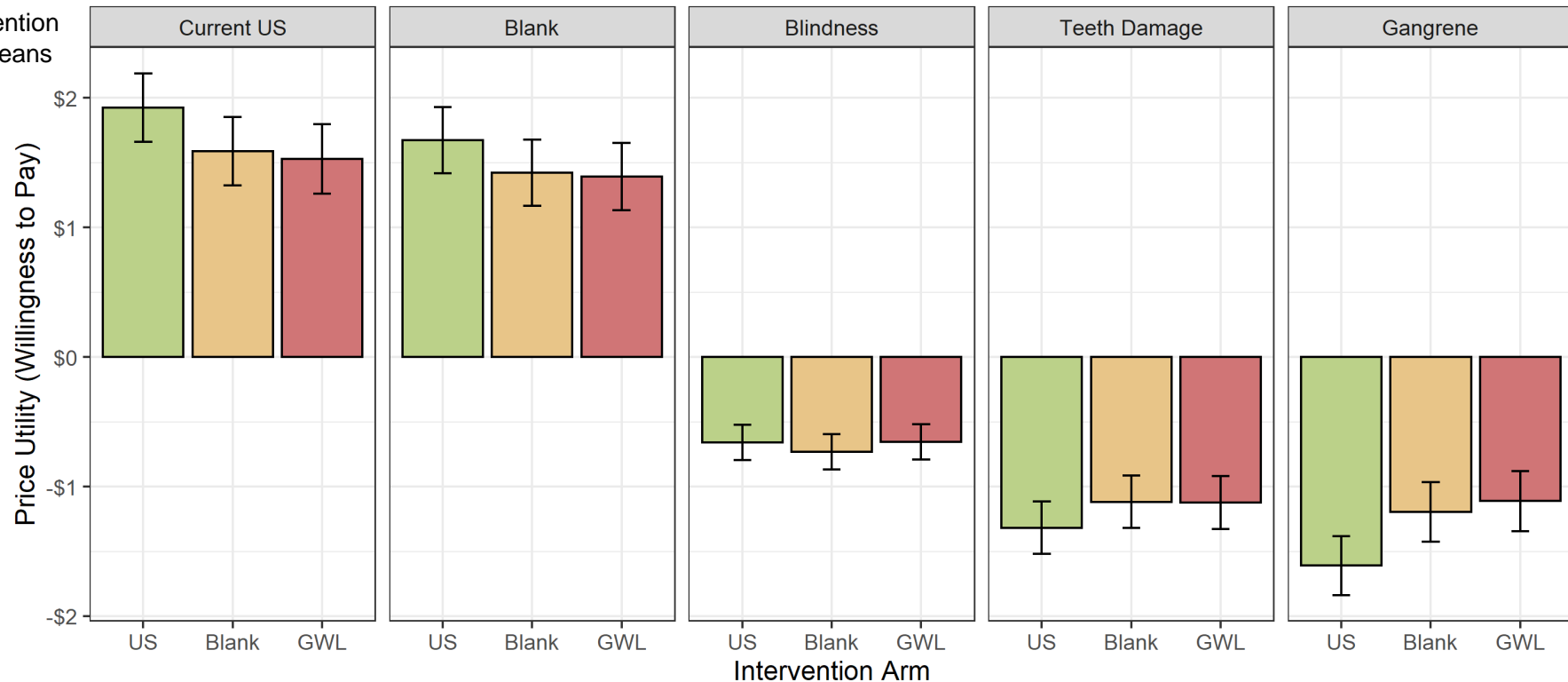


Adjusted Change in Willingness to Pay by Study Arm

Regressor	Outcome: Cigarette Pack Price Utility (i.e., Willingness-to-pay)				
	Current US	Blank	Blindness	Teeth Damage	Gangrene
3-month intervention arm					
US pack	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>
Blank pack	-0.34 (-0.72, 0.04)	-0.25 (-0.62, 0.11)	-0.07 (-0.27, 0.12)	0.20 (-0.09, 0.49)	0.42 (0.09, 0.74)*
GWL pack	-0.38 (-0.76, -0.00)*	-0.27 (-0.64, 0.10)	0.01 (-0.19, 0.20)	0.18 (-0.12, 0.47)	0.49 (0.16, 0.82)**
Baseline WTP	0.58 (0.46, 0.70)***	0.63 (0.51, 0.76)***	0.38 (0.25, 0.51)***	0.56 (0.44, 0.69)***	0.51 (0.40, 0.63)***

Note. From five separate baseline adjusted OLS regressions. Covariates included age, sex, race/ethnicity, education, cigarette brand preference, nicotine dependence, and brand appeal

Figure 2. Post-intervention estimated marginal means



\$

What's the price aversion **initially**?



Note. Estimates from within the GWL arm of the trial

\$

What's the price aversion after 3-months exposure?



Note. Estimates from within the GWL arm of the trial



Discussion

Pre-intervention

- Most important factor was Price (70%) then pack design (24%)
- US packs generated considerable appeal valuations, which was only slightly higher (~\$0.40) than blank packs with no marketing

Post-intervention

- Price importance remained unchanged, but the importance packaging was minimally reduced (2%)
- Participants assigned to the US pack arm experienced no significant change in willingness to pay
- Participants assigned Blank pack arm remained unchanged in their willingness to pay for all but one pack design (gangrene)



Discussion

Pre-intervention

- Overall, the impact GWLs had on product price perceptions was approximately equivalent to a substantial \$3.00 excise tax

Post-intervention

- Participants assigned to the GWL pack arm experienced a weakening in the discount needed to willingly purchase the 'Gangrene' pack suggesting wear-out from repeated exposure
- No change in the discount needed to willingly purchase the GWL packs not in the intervention ('Blindness' and 'Teeth Damage')
- Suggests that desensitization effects may be specific to repeated exposure which may be overcome by image refreshment



Limitations and Strengths

Limitations

- Price estimates tend to overstate the amount that consumers would pay
- RCT study groups were not stratified by conjoint estimates and these groups were not balanced on this measure
- Unable to estimate the impact for non-daily smokers, susceptible non-smokers or smokers ready to quit

Strengths

- Anchored choices on preferred brands the pack prices regularly paid
- Exposed participants to conjoint packs by allowing them to handle the designs for several minutes prior to completion of the first price task
- Purchased their cigarettes packaged in one of these designs for 3 month before once again completing the willingness-to-pay assessment.



Conclusion

- US packaging generates appeal and adds to the value of the product
- Graphic packaging engenders price aversion and represents a loss in perceived product value
- Yet this effect begins to wear out after a 3-months exposure to obtaining cigarettes in GWL packs, indicating a need for refreshment of GWL images
- Future studies are needed to determine whether these results translate to hybrid-style packaging proposed by Food and Drug Administration for implementation in the USA



Acknowledgments

Coauthors

David Strong, John Pierce, Eric Leas, Claudiu Dimofte and Noe Crespo

CASA Study Team

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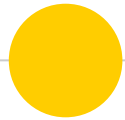
The Commonwealth of Australia

Awarded a license to the Regents of the University of California to use their cigarette package designs in a randomised trial on the effect of cigarette packaging on smoking perceptions and behavior in the USA



Thank You!

Any questions ?



Adjusted associations with Willingness to Pay

Regressor	Outcome: Pack Price Utility (Willingness-to-pay) ¹				
	Current US	Blank	Blindness	Teeth Damage	Gangrene
3-month intervention arm					
US pack	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>
Blank pack	-0.34 (-0.72, 0.04)	-0.25 (-0.62, 0.11)	-0.07 (-0.27, 0.12)	0.20 (-0.09, 0.49)	0.42 (0.09, 0.74)*
GWL pack ²	-0.38 (-0.76, -0.00)*	-0.27 (-0.64, 0.10)	0.01 (-0.19, 0.20)	0.18 (-0.12, 0.47)	0.49 (0.16, 0.82)**
Baseline WTP	0.58 (0.46, 0.70)***	0.63 (0.51, 0.76)***	0.38 (0.25, 0.51)***	0.56 (0.44, 0.69)***	0.51 (0.40, 0.63)***
Covariate Controls					
Age (years)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)
Sex					
Male	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>
Female	-0.08 (-0.41, 0.25)	-0.06 (-0.39, 0.26)	-0.05 (-0.22, 0.12)	0.06 (-0.20, 0.31)	-0.00 (-0.29, 0.29)
Race/Ethnicity					
White, non-Hispanic	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>
Hispanic	-0.16 (-0.68, 0.36)	0.04 (-0.46, 0.54)	0.02 (-0.24, 0.29)	0.01 (-0.38, 0.41)	0.08 (-0.36, 0.53)
Other, non-Hispanic	0.22 (-0.17, 0.61)	0.20 (-0.17, 0.58)	-0.17 (-0.37, 0.03)	-0.14 (-0.44, 0.16)	-0.12 (-0.46, 0.22)
Education					
College degree or +	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>	<i>Ref</i>
Some college	-0.06 (-0.39, 0.27)	-0.09 (-0.41, 0.23)	-0.02 (-0.19, 0.15)	0.14 (-0.12, 0.39)	0.00 (-0.28, 0.29)
High School or less	0.10 (-0.42, 0.62)	-0.10 (-0.61, 0.40)	0.06 (-0.21, 0.32)	0.16 (-0.24, 0.56)	-0.16 (-0.61, 0.29)
Cigarette Brand					
Marlboro					
American Spirit	0.02 (-0.41, 0.45)	-0.04 (-0.45, 0.38)	-0.30 (-0.52, -0.08)**	0.08 (-0.25, 0.41)	0.30 (-0.07, 0.67)
Camel	-0.09 (-0.47, 0.28)	0.03 (-0.32, 0.38)	0.17 (-0.02, 0.36)	-0.06 (-0.34, 0.22)	0.01 (-0.30, 0.33)
Newport	-0.08 (-0.80, 0.64)	-0.02 (-0.70, 0.66)	0.15 (-0.22, 0.51)	-0.44 (-0.99, 0.10)	0.48 (-0.14, 1.10)
Nicotine Dependence	-0.04 (-0.11, 0.04)	-0.03 (-0.10, 0.04)	0.01 (-0.02, 0.05)	0.02 (-0.04, 0.07)	0.05 (-0.01, 0.11)
Brand Appeal	0.12 (-0.01, 0.26)	0.07 (-0.06, 0.20)	-0.06 (-0.13, 0.01)	-0.09 (-0.20, 0.01)	-0.06 (-0.18, 0.06)

Effect of Packaging on Smoking Perceptions and Behavior: The CASA Randomized Trial



Blank Packaging



GWL Plain Packs licensed from the Commonwealth of Australia

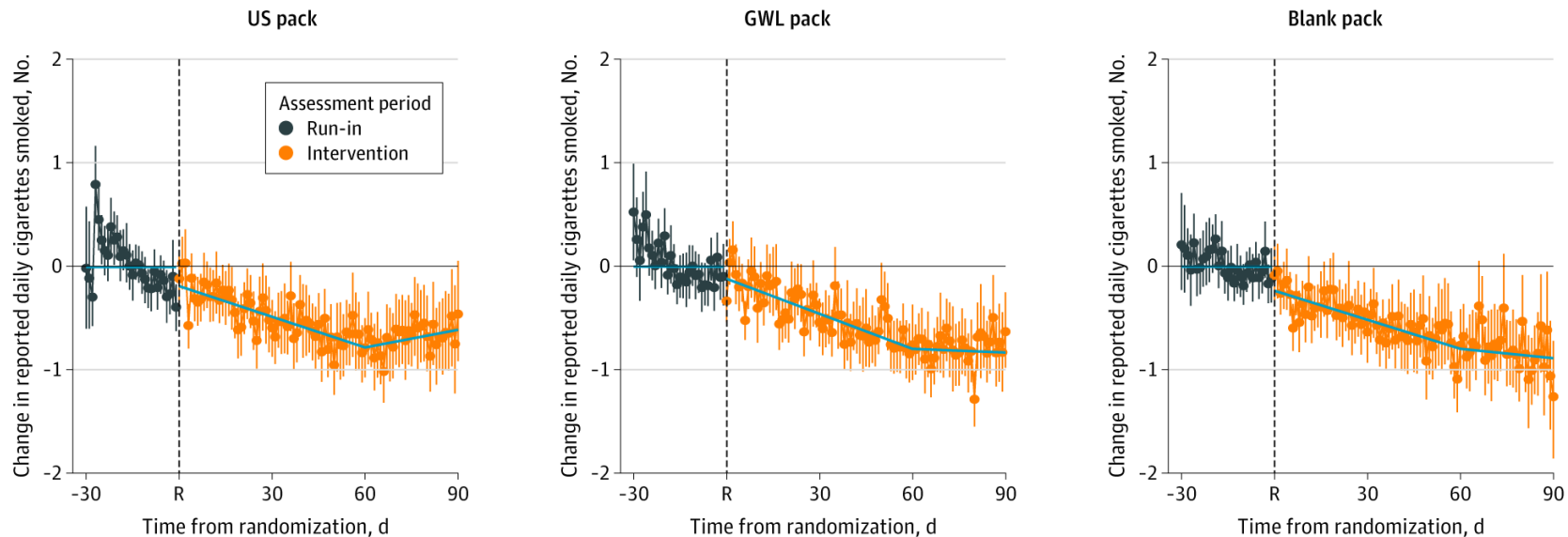


Original Investigation | Substance Use and Addiction

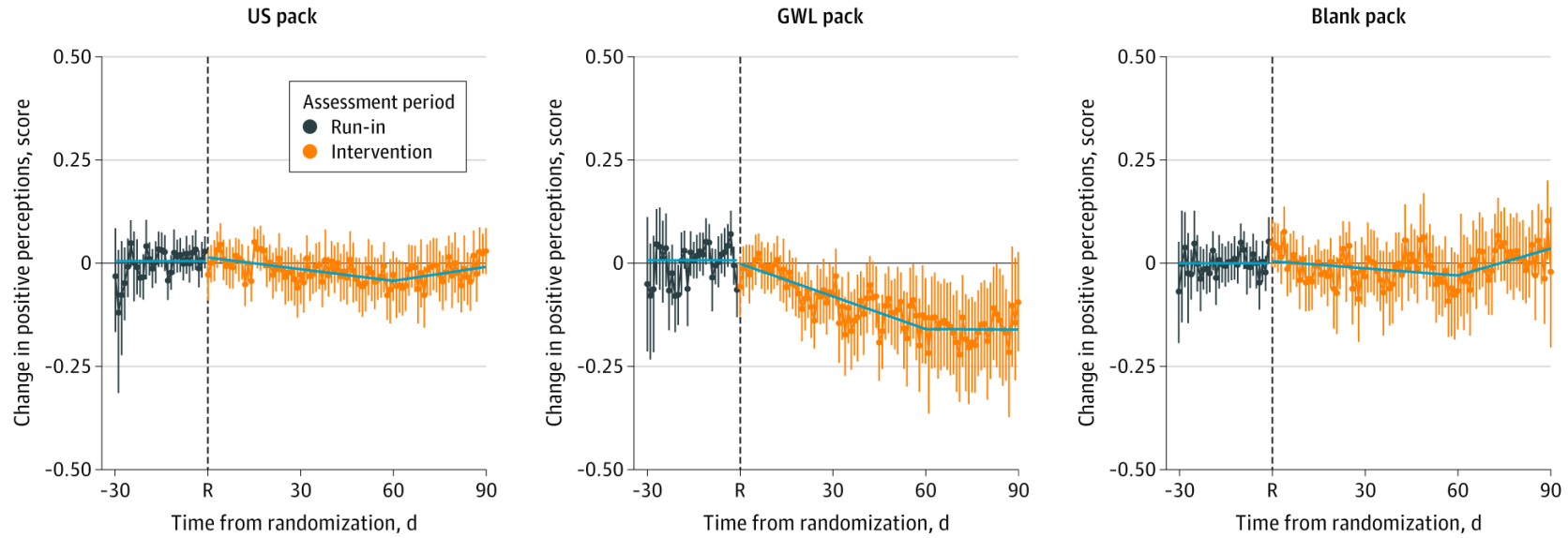
Effect of Graphic Warning Labels on Cigarette Packs on US Smokers' Cognitions and Smoking Behavior After 3 Months

A Randomized Clinical Trial

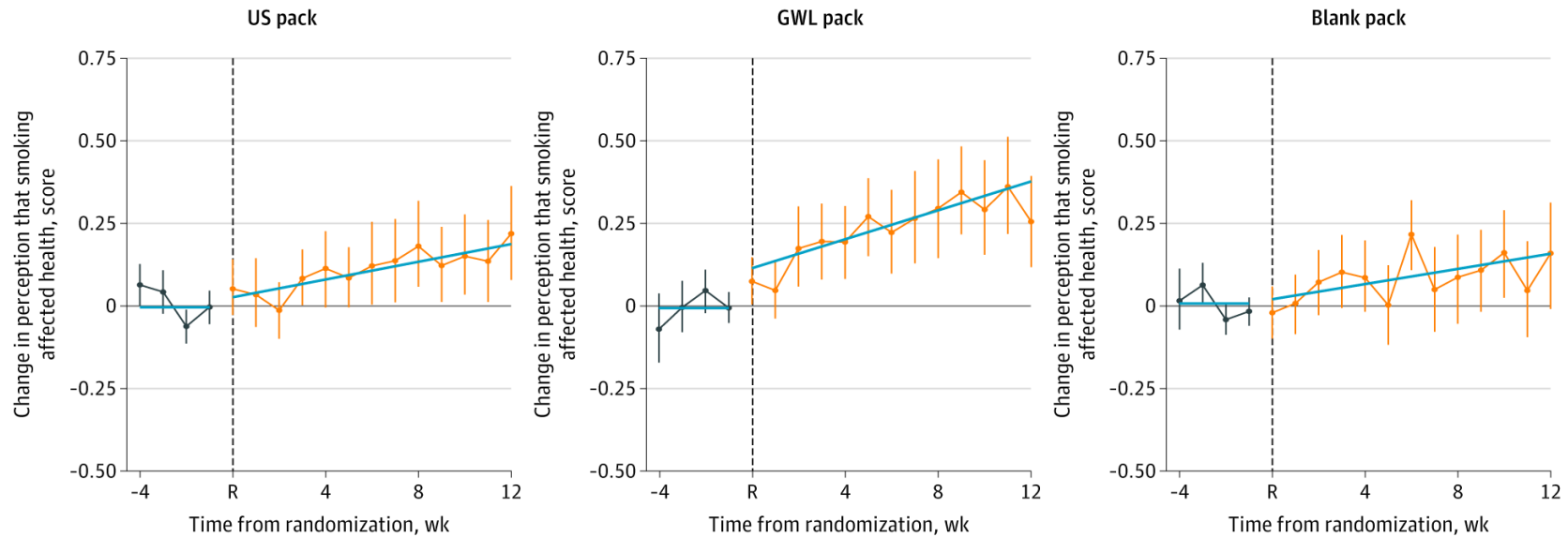
David R. Strong, PhD; John P. Pierce, PhD; Kim Pulvers, PhD; Matthew D. Stone, MS; Adriana Villaseñor, PhD; Minya Pu, MA; Claudiu V. Dimofte, PhD; Eric C. Leas, PhD; Jessica Oratowski, MPH; Elizabeth Brighton, BS; Samantha Hurst, PhD; Sheila Kealey, MPH; Ruifeng Chen, MS; Karen Messer, PhD



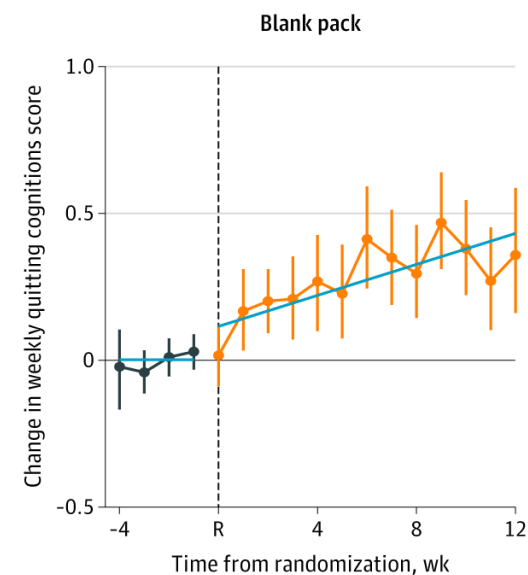
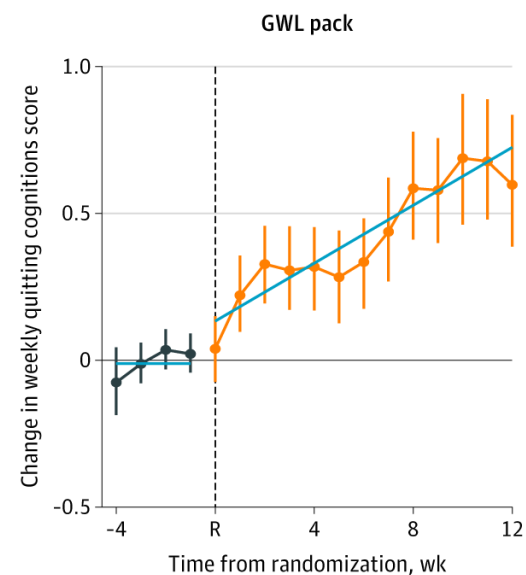
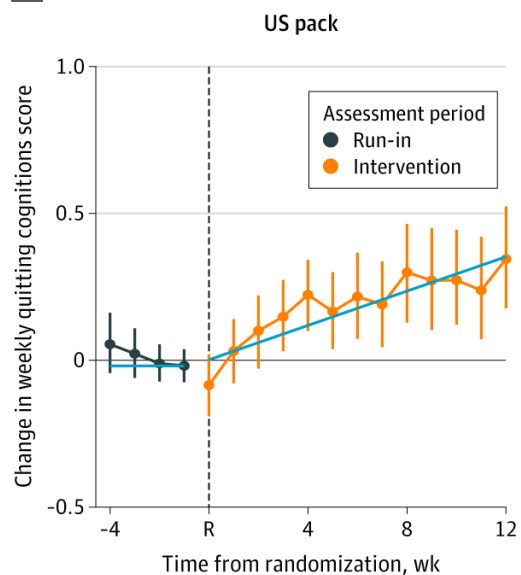
A Change in positive perceptions of recent cigarettes



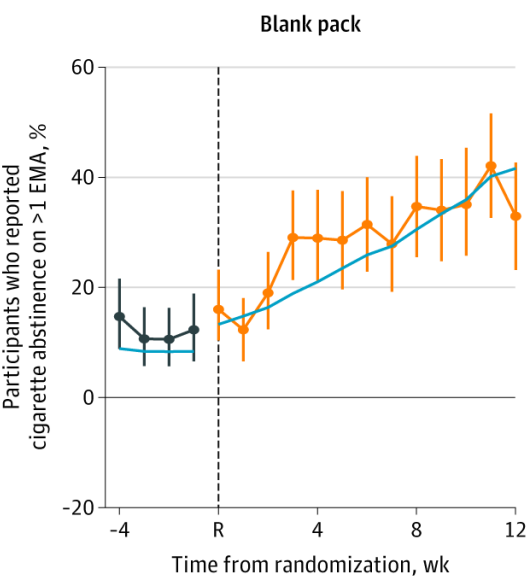
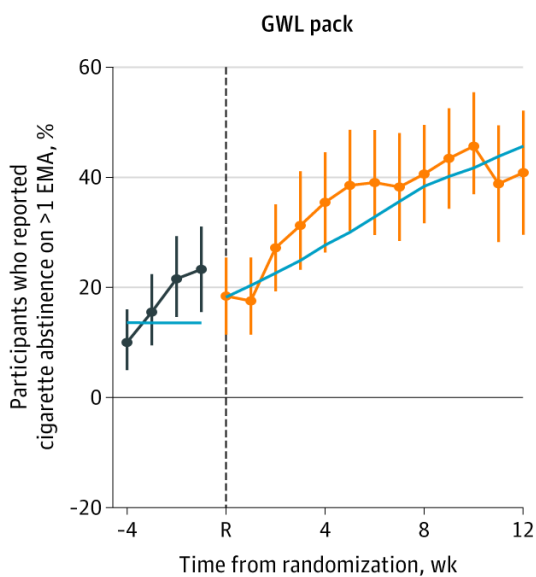
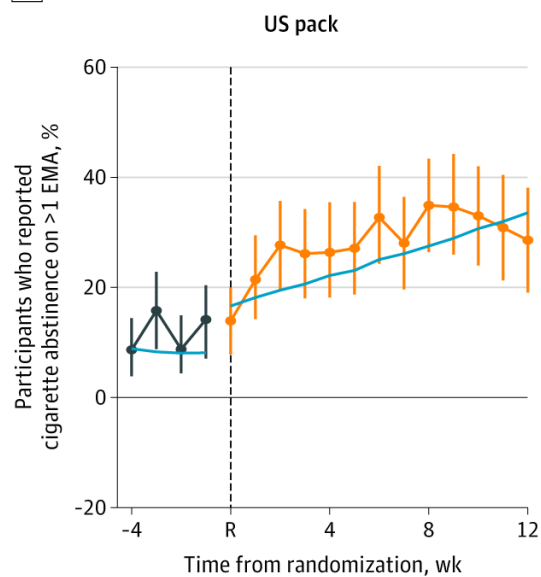
B Perceptions of health effects



A Change in quitting cognitions



B Participants with weekly abstinence





Pack **Handling** Task during Initial Exposure

Eye View Video Coding of Cigarette Pack Handling during Initial Exposure to Graphic Warning Labels



a. Attention to **Front** of Pack



b. Attention to **Left Side** of Pack

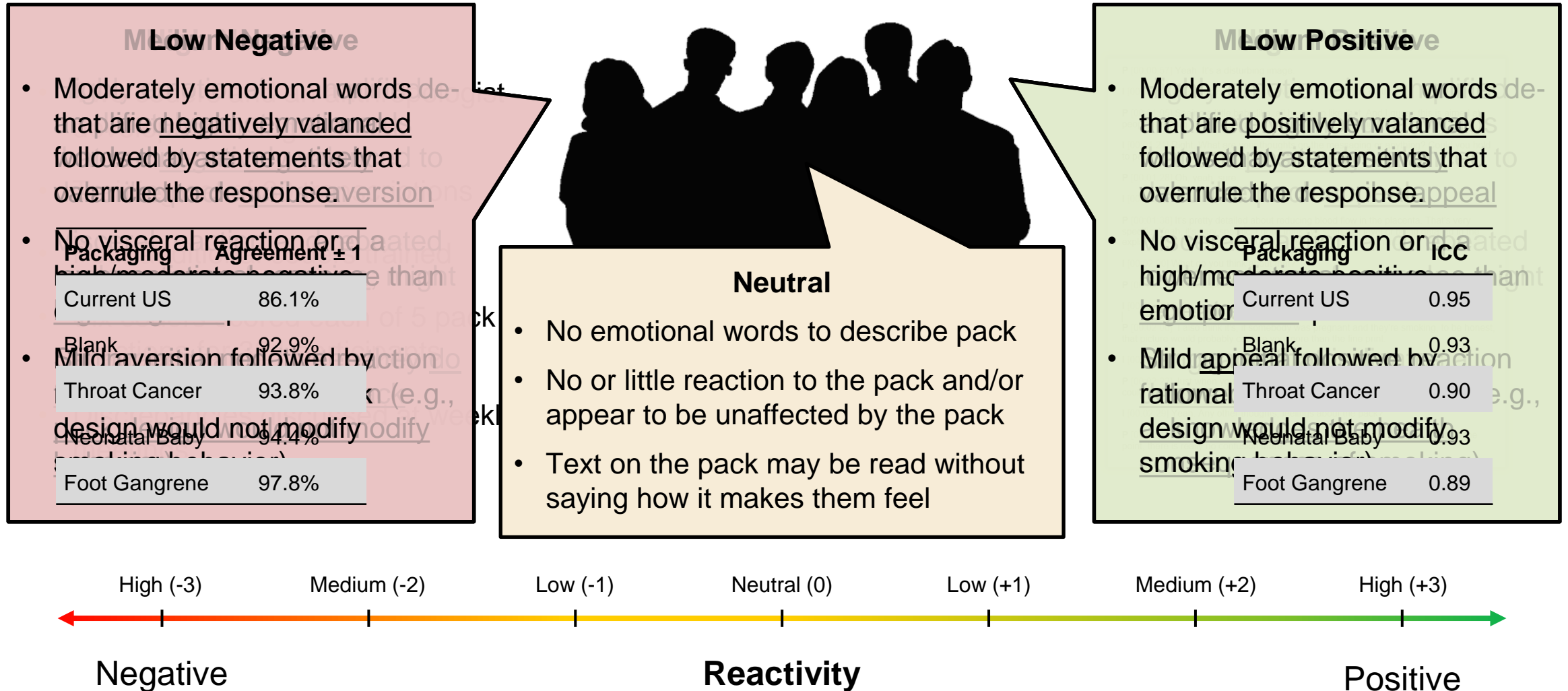


c. Attention to **Back** of Pack



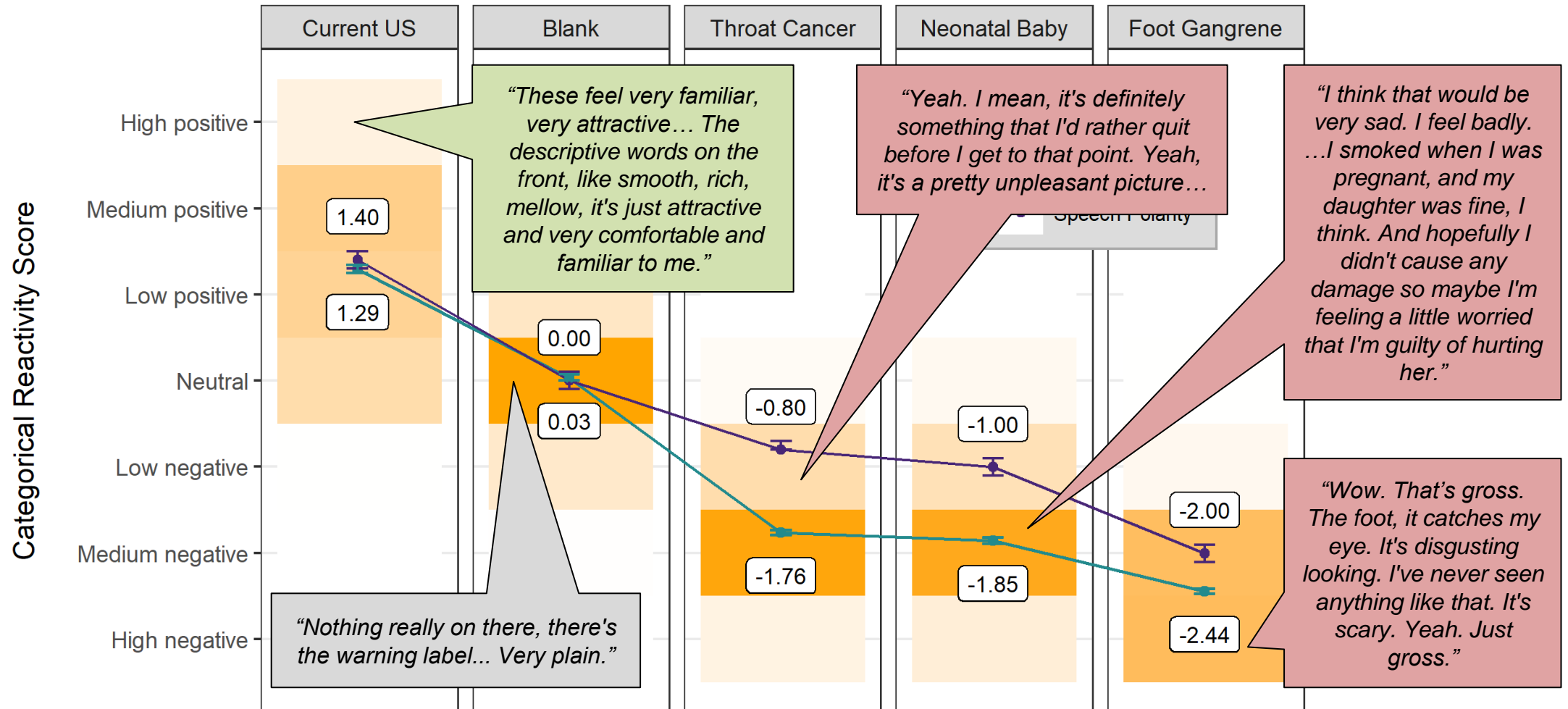


Coding **Reactivity**: Inter-Rater Reliability





Positive-Negative Reactivity and Speech Polarity





Natural Language Processing: Rate of Emotive Words

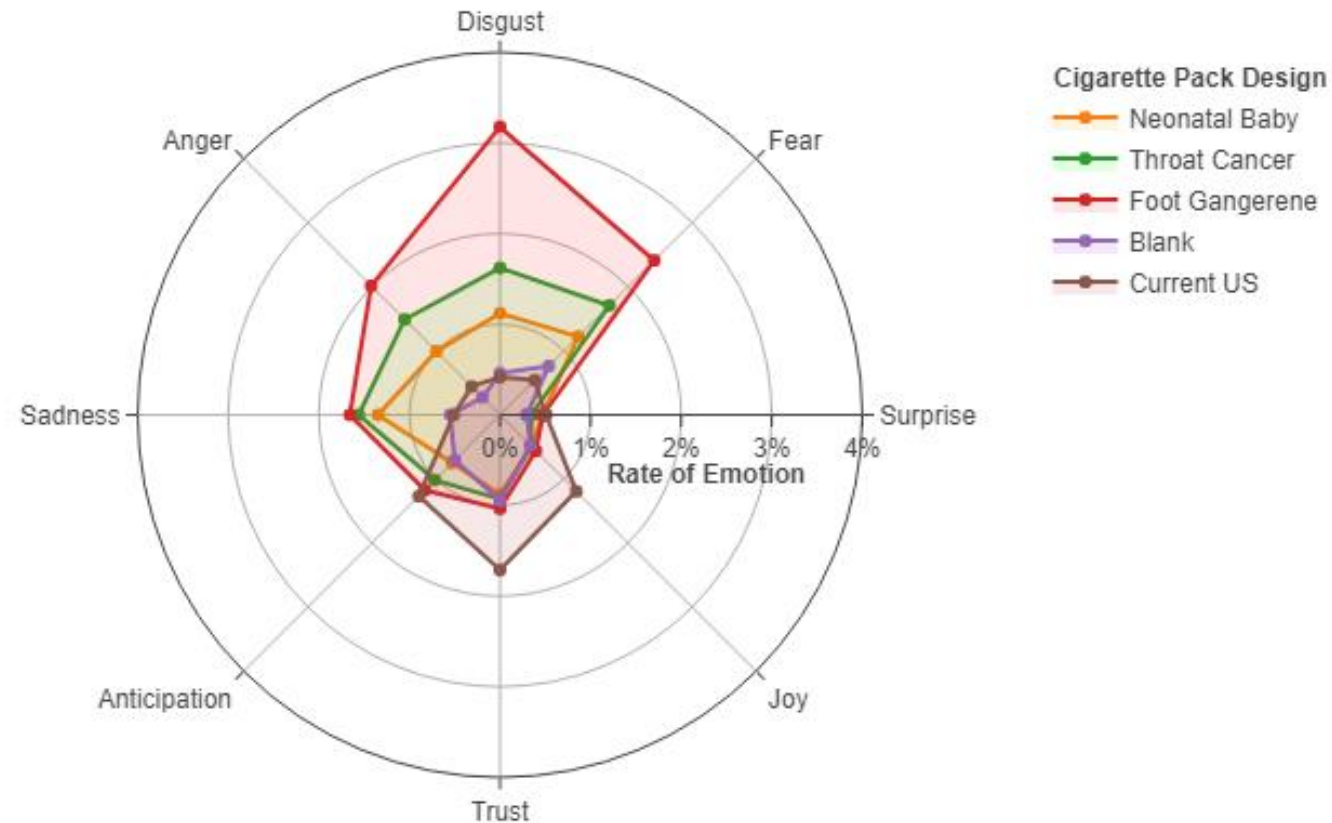
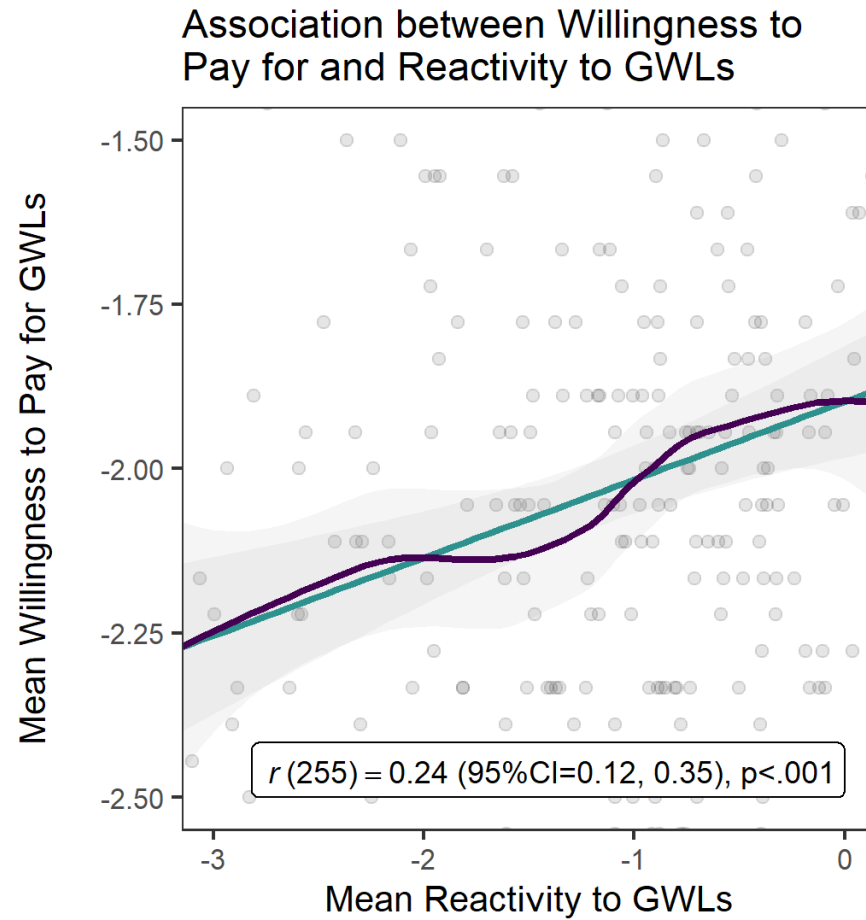


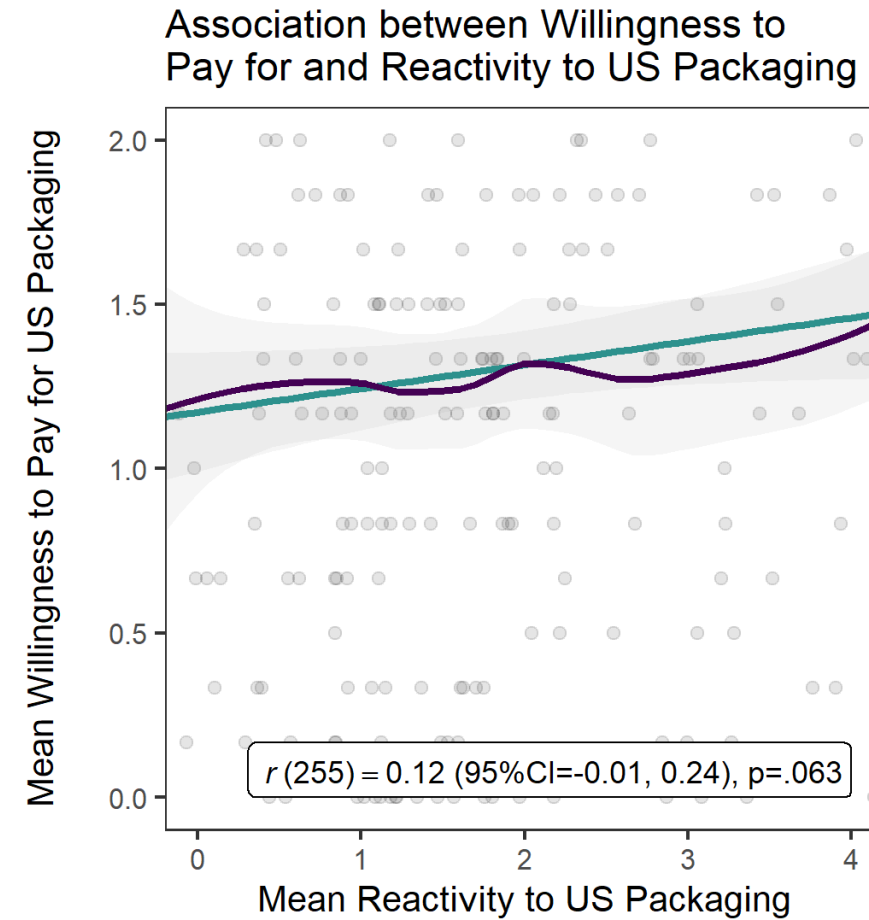
Figure 1. Average Rate of Emotive Words Spoken During Pack Exposure Period (n=324). A semantic analysis of transcribed speech that was text mined for emotive utterances using an emotion word lexicon and computing the rate of emotive words expressed per sentence between 0% (no words were emotive) and 100% (all words were emotive).



Association between Reactivity and Price Utility at V1



Estimator — Loess — LM



Estimator — Loess — LM