

Early Stage Investigator Lecture

Unpacking the Influence of E-Cigarette Marketing Features: Insights into Appeal, Engagement, and Behavior



Presented by:
Julia Chen-Sankey, Ph.D., M.A.
Rutgers School of Public Health



National Institutes of Health
Office of Disease Prevention

Unpacking the Influence of E-cigarette Marketing Features: Insights into Appeal, Engagement, and Behavior

Julia Chen-Sankey, PhD, MA

Assistant Professor

Rutgers School of Public Health

Rutgers Institute for Nicotine and Tobacco Studies

Disclosure

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- **Disclaimer:** Comments and opinions expressed belong to the presenter and do not necessarily represent the views of Rutgers University or the National Institutes of Health
- **Conflict of interest:** None

Presentation Overview



Introduction



Past and Ongoing Research Studies



Key Takeaways and Implications

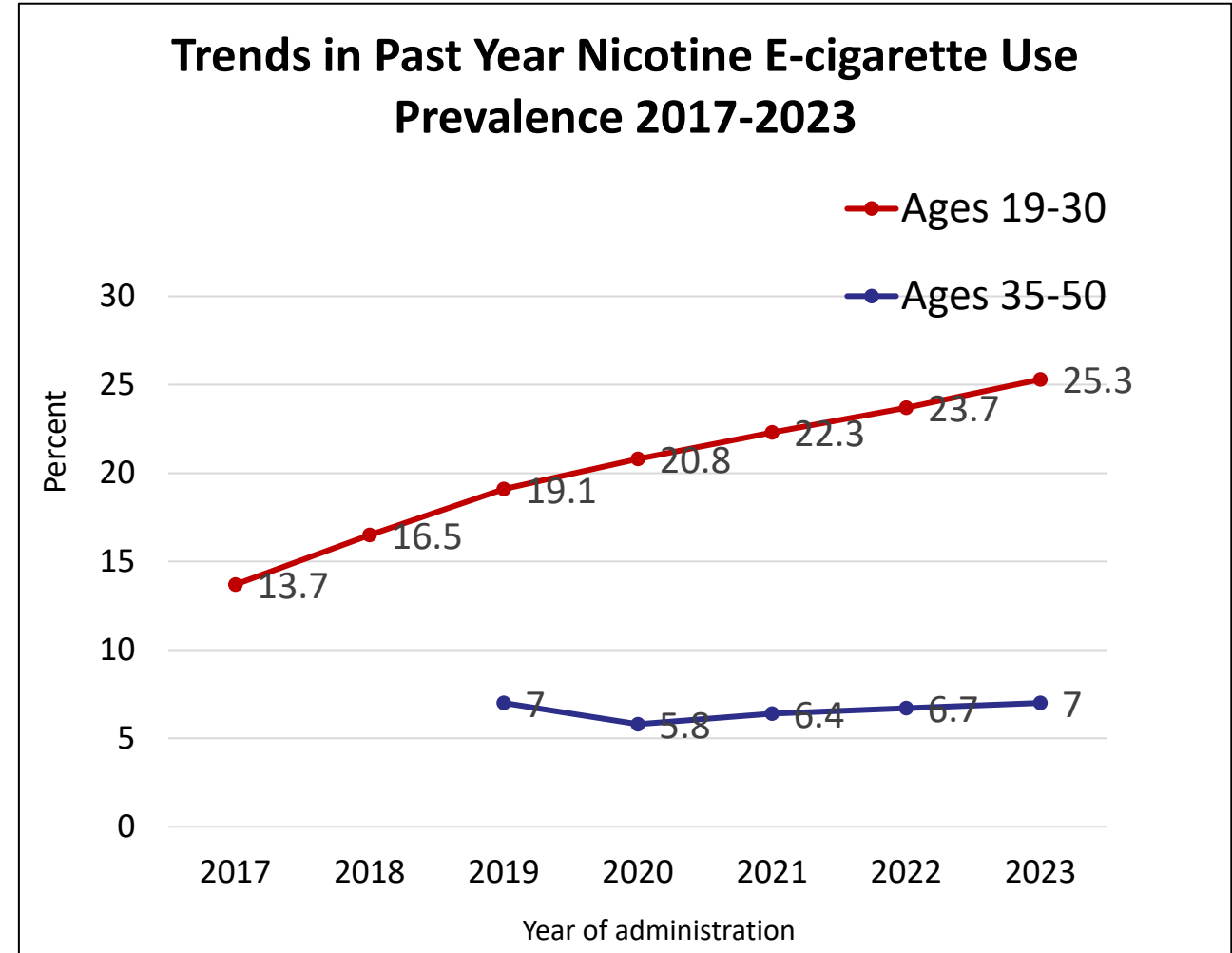


Future Research Directions

Introduction

Introduction

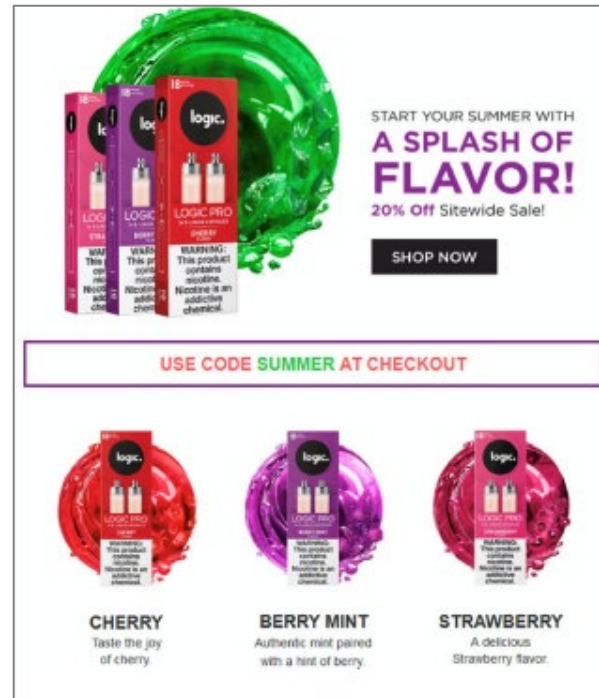
- Past-year e-cigarette use with nicotine among U.S. young adults (ages 19-30) increased from 13.7% to 25.3% between 2017 and 2023
- Nicotine e-cigarette use in young adulthood may lead to:
 - o Nicotine addiction
 - o Higher risk of using cigarettes and other substances
 - o Respiratory and lung illnesses
- o Nicotine e-cigarettes may serve as an effective tool for reducing smoking



Source: Monitoring the Future 2017-2023

Introduction (cont.)

- E-cigarette marketing exposure influences positive perceptions and use intentions of e-cigarette products among young adults
- More than 80% of U.S. young adults are exposed to e-cigarette ads in the past 6 months



Example e-cigarette ads

Introduction (cont.)

- However, few studies examined e-cigarette marketing influence at the ***feature level***
 - o E-cigarette advertising cannot be eliminated, but specific advertisement (ad) features may be regulated at the local and federal levels
 - o The U.S. FDA reviews marketing plans through premarket tobacco product applications to make policy decisions
 - o Means-end approach marketing theory: tangible product features are used to shape individuals' expectancies, reasons, and interest in using the marketed products
- K99/R00 award in tobacco regulatory science to investigate the influence of e-cigarette ad features among young adults

E-cigarette ad feature examples

Brand
Candy Flavor
Cartoon
Fruit/candy Image
Fruit Flavor
Minor Sales Restriction
Mint/Menthol Flavor
Model/People
Nicotine Warning
Personal Item
Positive Experience Claim
Price Promotion
Product Descriptor
Product Image
Product Package
Shopping/Purchasing Information
Smoker-targeted Claim
Tobacco Flavor

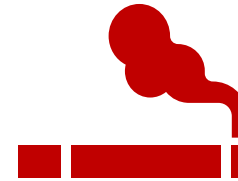
Public Health Conundrum

E-cigarette ads may influence two groups of young adults



Those who do not use tobacco

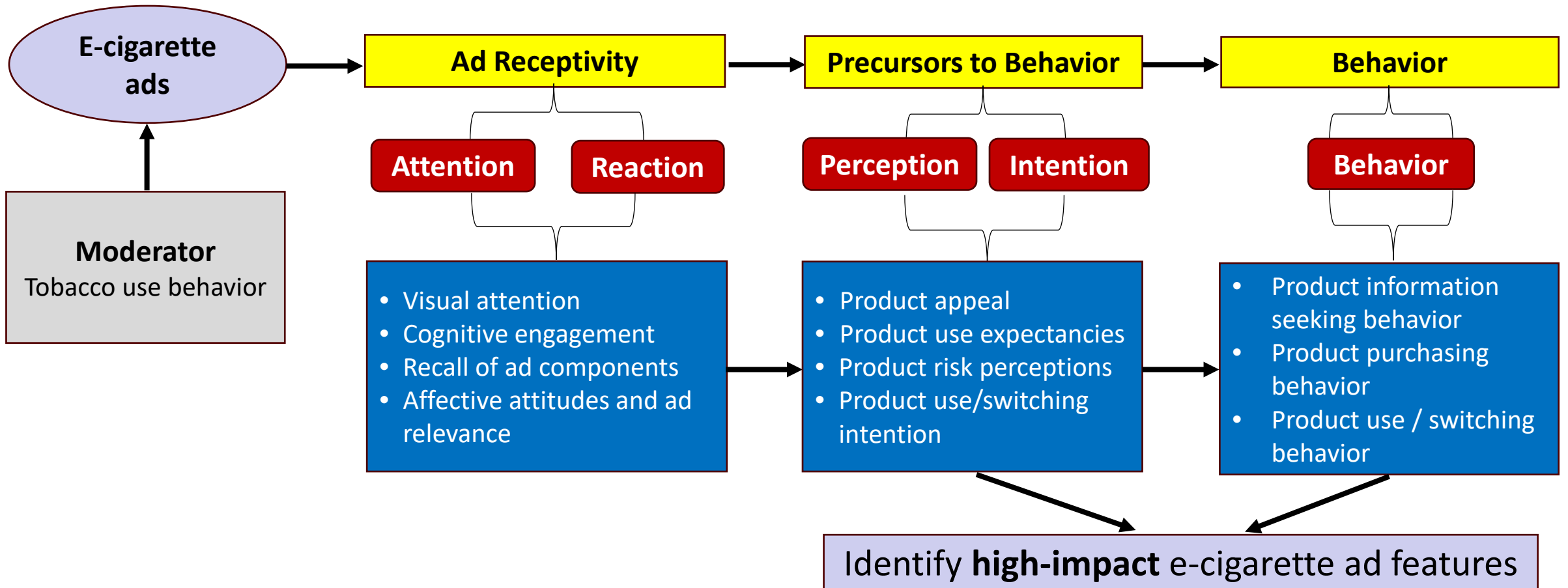
Using e-cigarettes can lead to nicotine addiction and other negative health consequences



Those who smoke cigarettes

Switching completely from cigarettes to e-cigarettes may reduce exposure to harmful chemicals

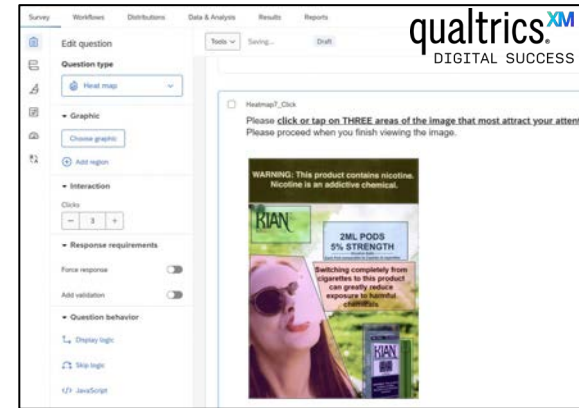
Message Impact Framework



Research Methods

- **Heatmap experiment (self-report)**
 - Assess self-reported visual attention to certain areas of an ad based on where participants click
- **Eye-tracking experiment (objective)**
 - Examine objectively assessed visual attention to ad features
- **Online experiment with randomized exposure (causal effect)**
 - Expose participants to only one or a few ad features to assess the causal effect compared to the control
- **One-on-one in-depth interviews (explanatory)**
 - Explore *how* certain ad features may influence perceptions

Qualtrics Heatmap Tool



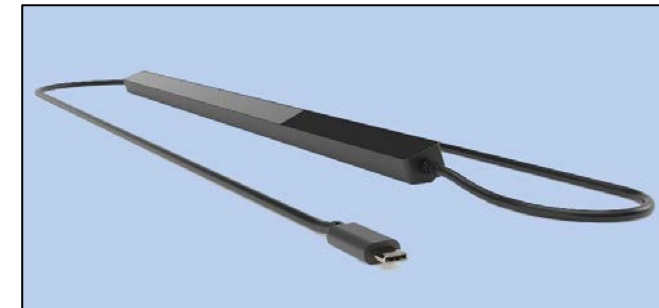
INTS Eye Tracking Lab



One-on-one in-depth interviews



Tobii Fusion Eye-tracker



Study 1

Noticing people, discounts and non-tobacco flavors in e-cigarette ads may increase e-cigarette product appeal among non-tobacco-using young adults

Chen-Sankey J, Jeong M, Wackowski OA, Unger JB, Niederdeppe J, Bernat E, Bansal-Travers M, Moran M, Kennedy RD, Broun A, Hacker K, Choi K. Noticing People, Discounts and Non-tobacco Flavors in E-cigarette Ads May Increase E-cigarette Product Appeal Among Non-tobacco-using Young adults. *Tob Control*. 2023;33(1):30-37.

Study 1 Methods

- Study population: Young adults who do not use tobacco ($n=1,933$) recruited from Qualtrics online study panels
 - Viewed 12 static e-cigarette ads (from magazines and consumer emails) in random order in a heatmap experiment
 - Self-reported visual attention to the **ad features** by clicking on the areas of the ads they noticed
 - Responded to questions about **e-cigarette product appeal** (ad liking, product curiosity, product use interest)
- Statistical analysis: Used generalized estimating equation (GEE) models to analyze within-person associations between noticing e-cigarette ad features and perceived e-cigarette product appeal

Example of e-cigarette ad labeled with areas of interest



Study 1 Results

Associations between noticing e-cigarette ad features and e-cigarette product appeal, adjusting for noticing other ad features and participant characteristics ($n=1,993$)

	Any product appeal		Ad liking		Product curiosity		Use interest	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
People	1.16	1.08 to 1.24	1.19	1.10 to 1.29	1.07	0.99 to 1.17	1.05	0.93 to 1.19
Brand	0.94	0.86 to 1.03	0.94	0.84 to 1.05	0.97	0.87 to 1.09	0.89	0.75 to 1.05
Discount	1.11	1.02 to 1.21	1.08	0.98 to 1.20	1.18	1.06 to 1.30	1.17	1.01 to 1.36
Other promotions	1.01	0.91 to 1.12	0.99	0.88 to 1.11	1.02	0.90 to 1.16	1.08	0.91 to 1.29
Purchasing information	1.00	0.91 to 1.10	0.88	0.79 to 0.99	1.04	0.93 to 1.16	1.02	0.87 to 1.20
Tobacco flavour	0.98	0.91 to 1.06	0.95	0.87 to 1.03	0.99	0.90 to 1.08	0.97	0.85 to 1.10
Menthol flavour	1.12	1.04 to 1.21	1.06	0.97 to 1.17	1.08	0.99 to 1.19	1.01	0.88 to 1.16
Mint/fruit flavour	1.15	1.04 to 1.27	1.11	0.99 to 1.25	1.22	1.09 to 1.37	1.27	1.08 to 1.50
Nicotine warning	0.81	0.75 to 0.87	0.80	0.74 to 0.88	0.72	0.65 to 0.79	0.65	0.56 to 0.75
Smoking cessation claim	0.89	0.83 to 0.96	0.85	0.78 to 0.93	0.91	0.83 to 0.99	1.01	0.89 to 1.15
Positive experience claim	1.29	1.15 to 1.47	1.35	1.18 to 1.54	1.24	1.08 to 1.42	0.95	0.77 to 1.18
Product image	1.09	1.02 to 1.16	1.09	1.01 to 1.18	1.08	1.01 to 1.18	1.04	0.93 to 1.16
No sales to minors	0.85	0.65 to 1.10	0.85	0.62 to 1.16	0.85	0.61 to 1.18	0.80	0.49 to 1.31
Other features	1.13	1.04 to 1.23	1.10	0.99 to 1.22	1.26	1.14 to 1.38	1.25	1.08 to 1.45

*The GEE models simultaneously adjusted for noticing all other e-cigarette ads features and participant characteristics.

†The bolded text indicates significance level $p < 0.05$.

AOR, adjusted OR; GEE, generalised estimating equation.

Positive association

Negative association

Study 2

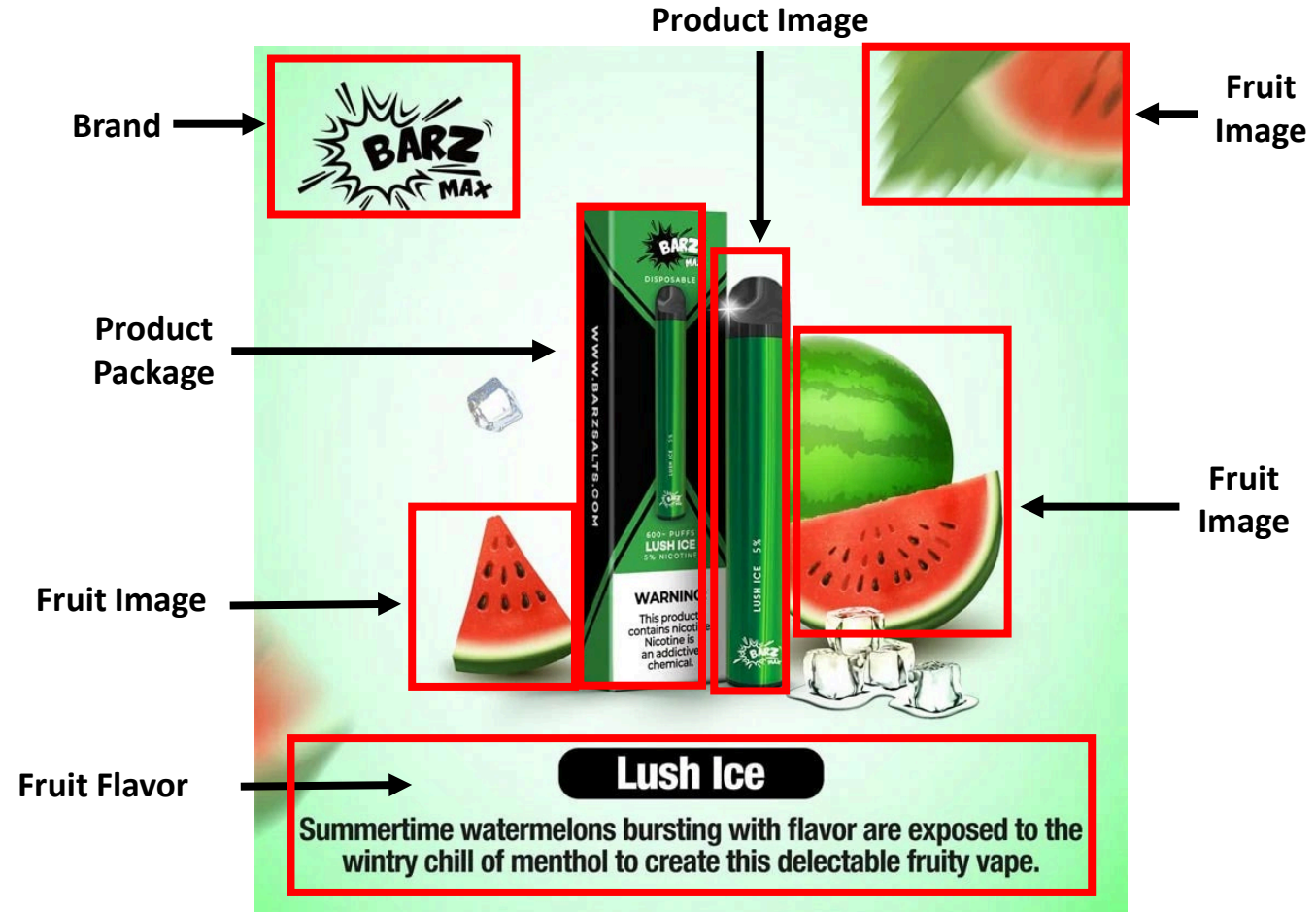
Associations between noticing e-cigarette advertising features and e-cigarette appeal and switching interest among young adult dual users

Chen-Sankey J, Elhabashy M, La Capria K, Jeong M, Klein EG, Villanti AC, Wackowski OA.
Associations Between Noticing E-Cigarette Advertising Features and E-Cigarette Appeal and
Switching Interest Among Young Adult Dual Users. *Substance Use & Misuse*.
2024;59(12):1758-1769.

Study 2 Methods

- Study population: Young adults who smoke cigarettes and use e-cigarettes ($n=1,821$) recruited from Qualtrics online study panels
 - Viewed 12 static e-cigarette ads (from magazines and online websites) in random order in a heatmap experiment
 - Self-reported visual attention to the **ad features** by clicking on the areas of the ads
 - Responded to questions about **e-cigarette product appeal** (ad liking, product curiosity, product use interest) and **interest in product switching**
- Statistical analysis: Used generalized estimating equation (GEE) models to analyze within-person associations between noticing e-cigarette ad features and perceived e-cigarette product appeal and switching interest

Example of e-cigarette ad labeled with areas of interest



Study 2 Results

Associations between noticing e-cigarette ad features and e-cigarette product appeal and switching interest, adjusting for noticing other ad features and participant characteristics ($n=1,821$)

	Any Product Appeal		Interest in Product Switching	
	AOR	95% CI	AOR	95% CI
People	0.89	0.84, 0.95**	1.01	0.94, 1.08
Brand	0.96	0.90, 1.03	0.97	0.90, 1.03
Price Promotion	1.23	1.13, 1.34***	1.05	0.97, 1.15
Shopping Information	0.98	0.86, 1.12	0.94	0.81, 1.07
Pack Image	0.75	0.68, 0.80***	0.92	0.83, 1.01
Product Descriptor	1.00	0.92, 1.09	0.93	0.83, 1.01
Nicotine Warning	0.74	0.67, 0.80***	0.86	0.80, 0.94**
Product Image	0.92	0.86, 0.97**	0.95	0.89, 1.02
Smoker-targeted Claim	0.78	0.73, 0.83***	0.89	0.80, 0.95**
Positive Experience Claim	0.98	0.88, 1.09	0.89	0.79, 1.02
Tobacco Flavor	0.92	0.85, 0.99*	0.90	0.83, 0.98**
Menthol Flavor	0.95	0.72, 1.25	1.01	0.75, 1.34
Mint Flavor	0.94	0.86, 1.03	0.94	0.85, 1.03
Fruit Flavor	1.67	1.49, 1.86***	1.28	1.08, 1.42***
Fruit Image	1.53	1.36, 1.73***	1.21	1.09, 1.36**
No Sales to Minor	1.12	0.74, 1.68	0.93	0.60, 1.44
Other Features	0.95	0.88, 1.0	1.04	0.97, 1.12

Positive association

Negative association

¹The GEE models simultaneously adjusted for noticing all other e-cigarette ads features and all participant characteristics.

²Significance level * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$.

Study 3

Using eye tracking to examine young adults' visual attention to e-cigarette advertising features and associated positive e-cigarette perceptions

Chen-Sankey J, Weiger C, La Capria K. Using Eye tracking to Examine Young Adults' Visual Attention to E-cigarette Advertising Features and Associated Positive E-cigarette Perceptions. *Annals of Behavioral Medicine*. 2024;58(6):445-456.

Study 3 Methods

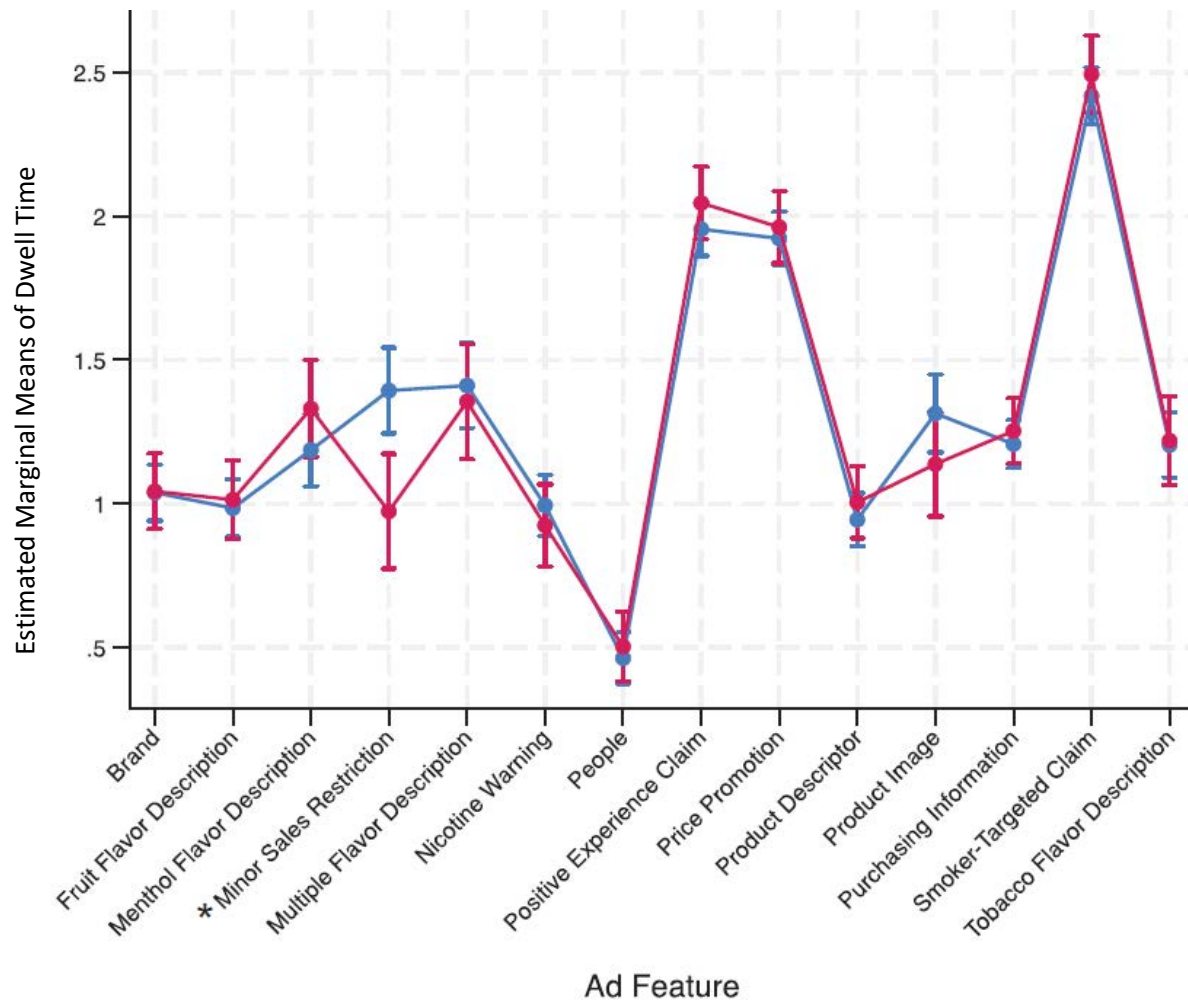
- Study population: young adults who do not use tobacco ($n=71$) and young adults who smoke cigarettes ($n=40$), recruited from social media platforms
- Study procedures:
 - Participants viewed 30 cartridge and pod-based e-cigarette ads published in magazines and direct consumer emails as an eye-tracking device (Tobii Fusion) tracked their eye movements
 - Participants completed a post-exposure survey
- Measures
 - Eye-tracking measures for each predetermined AOI: **dwell time (fixation duration)** and **entry time (time to first fixation)**
 - **Self-reported positive perceptions** (product appeal and positive use expectancies) of the e-cigarettes shown in the ads

Example of e-cigarette ad labeled with areas of interest

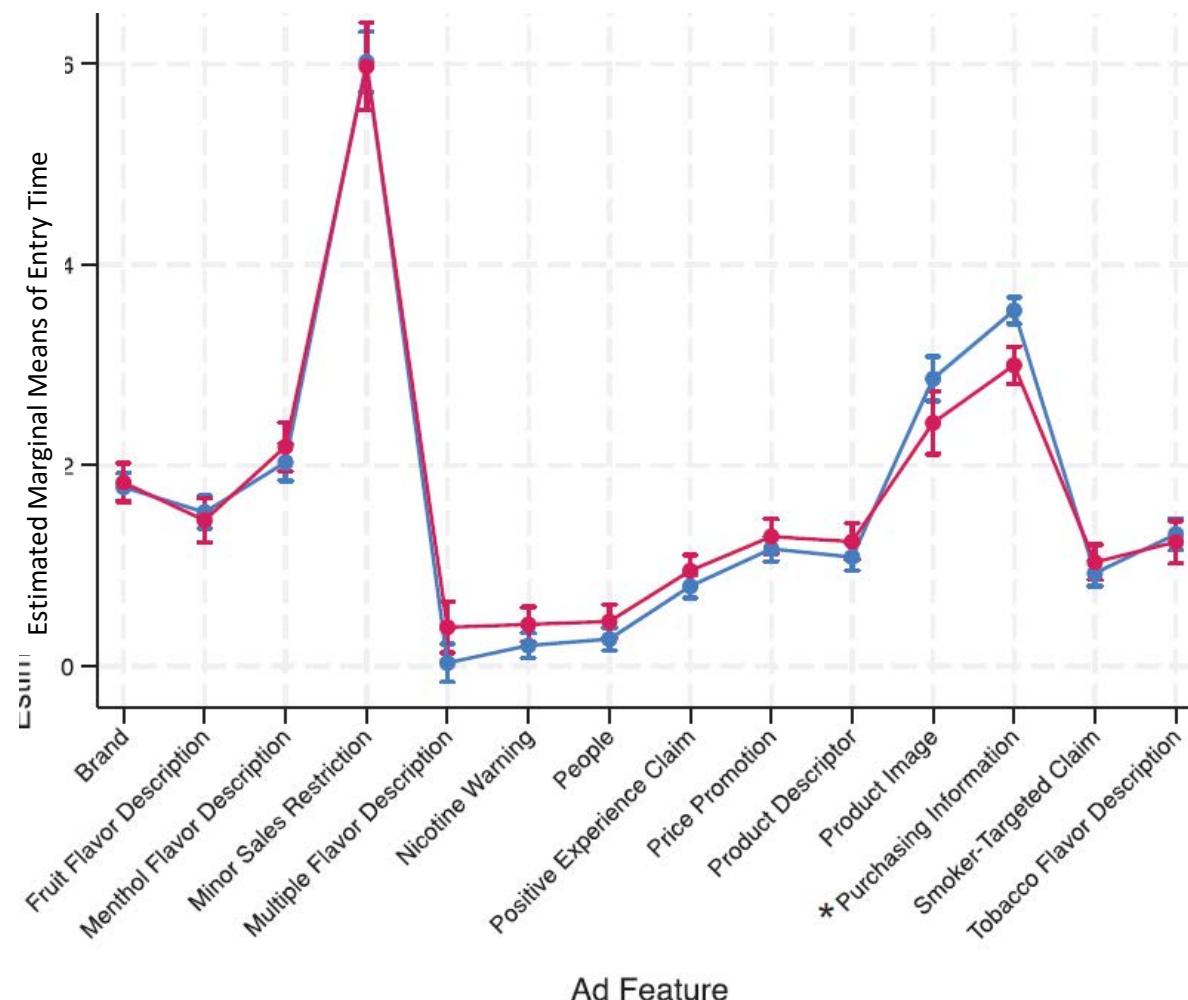


Study 3 Results

Standardized dwell time by ad feature and tobacco use group



Standardized entry time by ad feature and tobacco use group

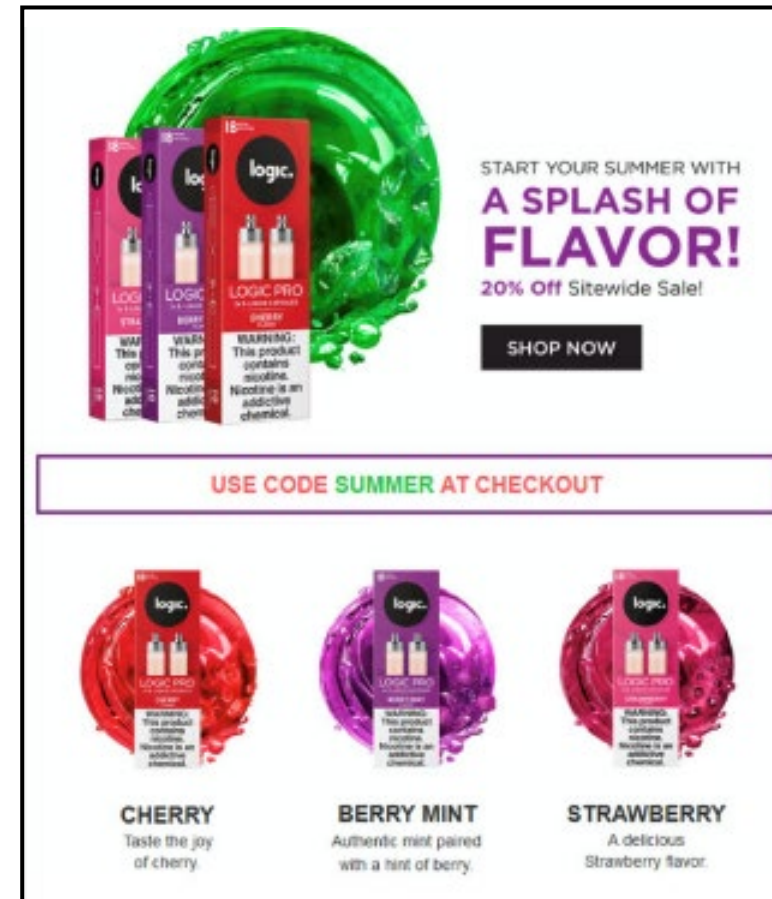


Study 3 Results

Longer dwell time for **multiple fruit flavor descriptors** was positively associated with **increased e-cigarette appeal**



Longer entry time for **fruit flavor descriptors** was negatively associated with **positive e-cigarette use expectancies**



Study 4

Exploring the influence of e-cigarette ad features on perceived product appeal and use interest among young adults of varying tobacco-use behaviors

La Capria K, Uriarte C, Elhabashy M, Menkevich M, Maxton O, Awadalla J, Tan ASL, Moran MB, **Chen-Sankey J**. Exploring the Influence of E-cigarette Ad Features on Perceived Product Appeal and Use Interest Among Young Adults of Varying Tobacco-Use Behaviors. *Nicotine Tob Res*. Published online August 18, 2023:ntad150.

Study 4 Methods

- **Study population:** young adults who do not use tobacco ($n=26$) and young adults who smoke cigarettes ($n=26$), recruited from social media platforms
- Participants viewed 30 e-cigarette ads (from the Eye-tracking study)
- **One-on-one in-depth interviews** were conducted to discuss how the ad features influence perceptions and interests in using e-cigarettes
- Reflexive thematic analysis method

Examples of in-depth interview questions

- What came to your mind when you saw those e-cigarette ads?
- Was there one ad that stood out to you the most and why?
- Could you describe particular features or components of the ads that stood out to you?
 - What did you think of [the feature]?
 - How did you like [the feature]?
 - Did [the feature] make you interested in using (or switching to) e-cigarettes?

Study 4 Results

Theme 1: Fruit flavors are appealing and generate use interest

- *“Well, I know what blueberry tastes like. I know I like blueberry. Maybe I’ll like this blueberry too, you know? That would be a comforting factor.”* –Female, 23, does not use tobacco
- *“They’re just appealing, the colorful ones. That makes me think about my vape or which vapes I want to try. I like to try different flavors and experiment, so yeah.”* –Female, 25, smokes cigarettes

Theme 2: Smoker-targeted claims are unconvincing and reduce use interest

- *“These messages made me less interested because it’s making such a bold claim with no proof. It’s just saying it, so it doesn’t convince me.”* –Female, 23, does not use tobacco
- *“And [smoker-targeted claims] kind of make me want to use e-cigarettes less because it’s like well, you are still bad. Like these are still bad products. They’re not good for you. They’re just an alternative. And, so, that seemed kind of sketchy.”* –Male, 19, smokes cigarettes

Theme 3: Price promotions are appealing and generate use interest among those who smoke

- *“I think one of them said buy 10, get 10 free or something like that. It was pretty cool. Pretty interesting. Seems like a good deal.”* –Female, 23, smokes cigarettes
- *“I would have to check about it, yeah, if it was like a lot cheaper than buying a pack of cigarettes, next time I might use that and buy a vape, yeah.”* –Male, 23, smokes cigarettes

Study 4 Results

Theme 4: Nicotine warnings are unappealing and reduce use interest among those who do not use tobacco

- *“Less interested for sure because of the fact that they even had to put something like [the warning] on an advertisement shows you how harmful it is.”* –Female, 19, does not use tobacco
- *“The nicotine warning definitely deterred me from even indulging in that product. You know, it was kind of just like a gross label, you know? It was like a red mark, like, of death, like get away from that ad, you know?”* – Male, 21, does not use tobacco

Theme 5: Positive experience testimonials are appealing and generate use interest among those who smoke

- *“I would say they did make me interested, especially when they had testimonials, for example, from former smokers. Some of the claims that they made like the smell and the ability to not leave the house did appeal to me.”* –Female, 27, smokes cigarettes
- *“That really was what sort of started turning my opinion towards [wanting to try e-cigarettes], was the testimonials and some of the points made in them.”* –Male, 23, smokes cigarettes

Example of positive experience testimonial



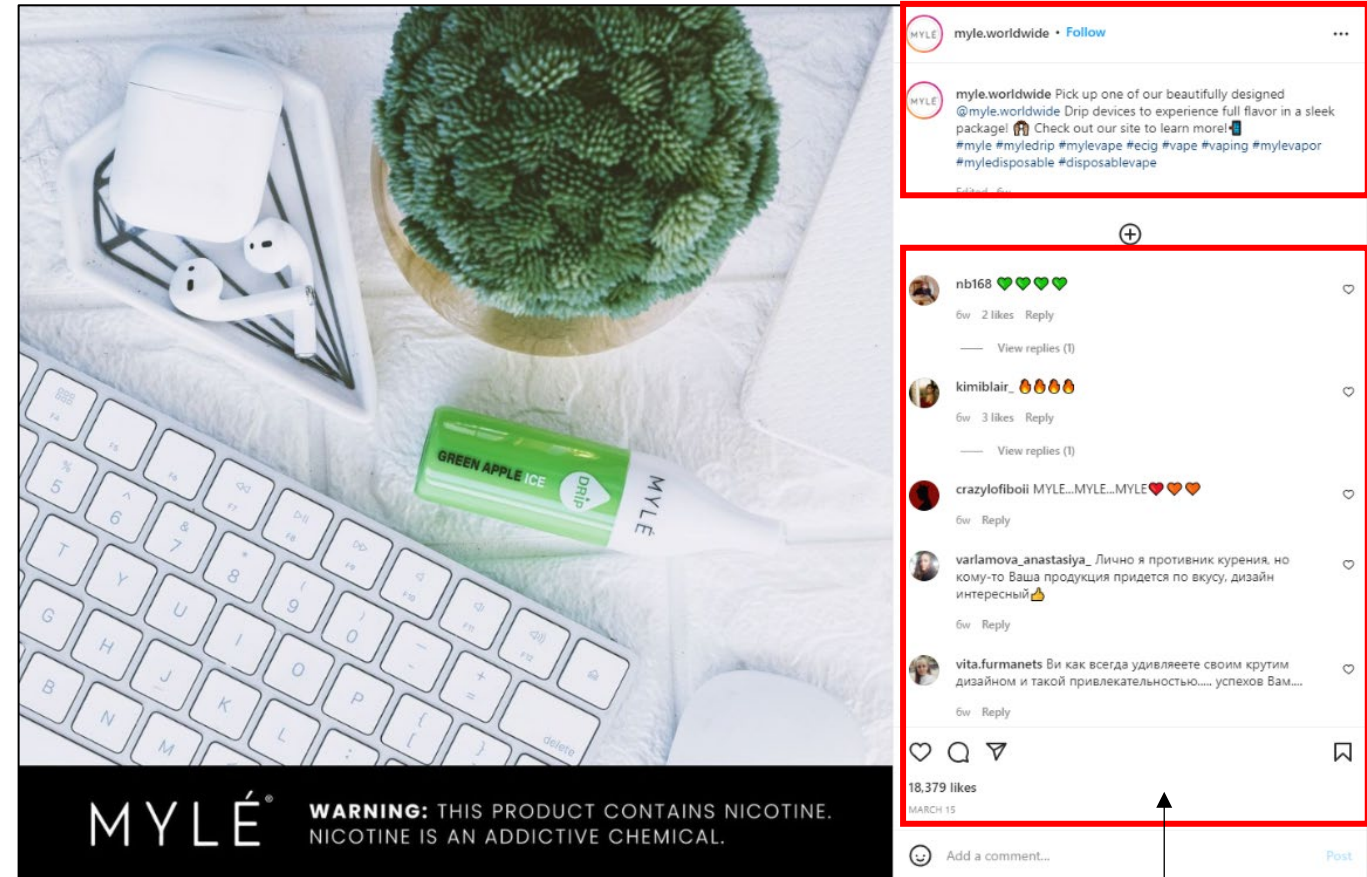
Study 5

Young adults' visual attention to features of social media marketing for disposable e-cigarettes and associated perceptions

Chen-Sankey J, Weiger C, La Capria K, Vassey J, Jeong M, Phan L, Unger JB, Allem J, Berg CJ, Choi K. Young Adults' Visual Attention to Features of Social Media Marketing for Disposable E-cigarettes and Associated Perceptions. *Addiction*. 2025;120(3):439-451.

E-cigarette Marketing on Social Media

- Social media platforms are widely used by tobacco companies, retailers, and influencers to promote disposable e-cigarettes
- Important to assess due to the high and frequent use of social media sites among young adults (Instagram is among the most popular)
- Instagram is used by leading disposable brands to promote products
- Additional features that are specific to social media
 - Social media account
 - Social media comment



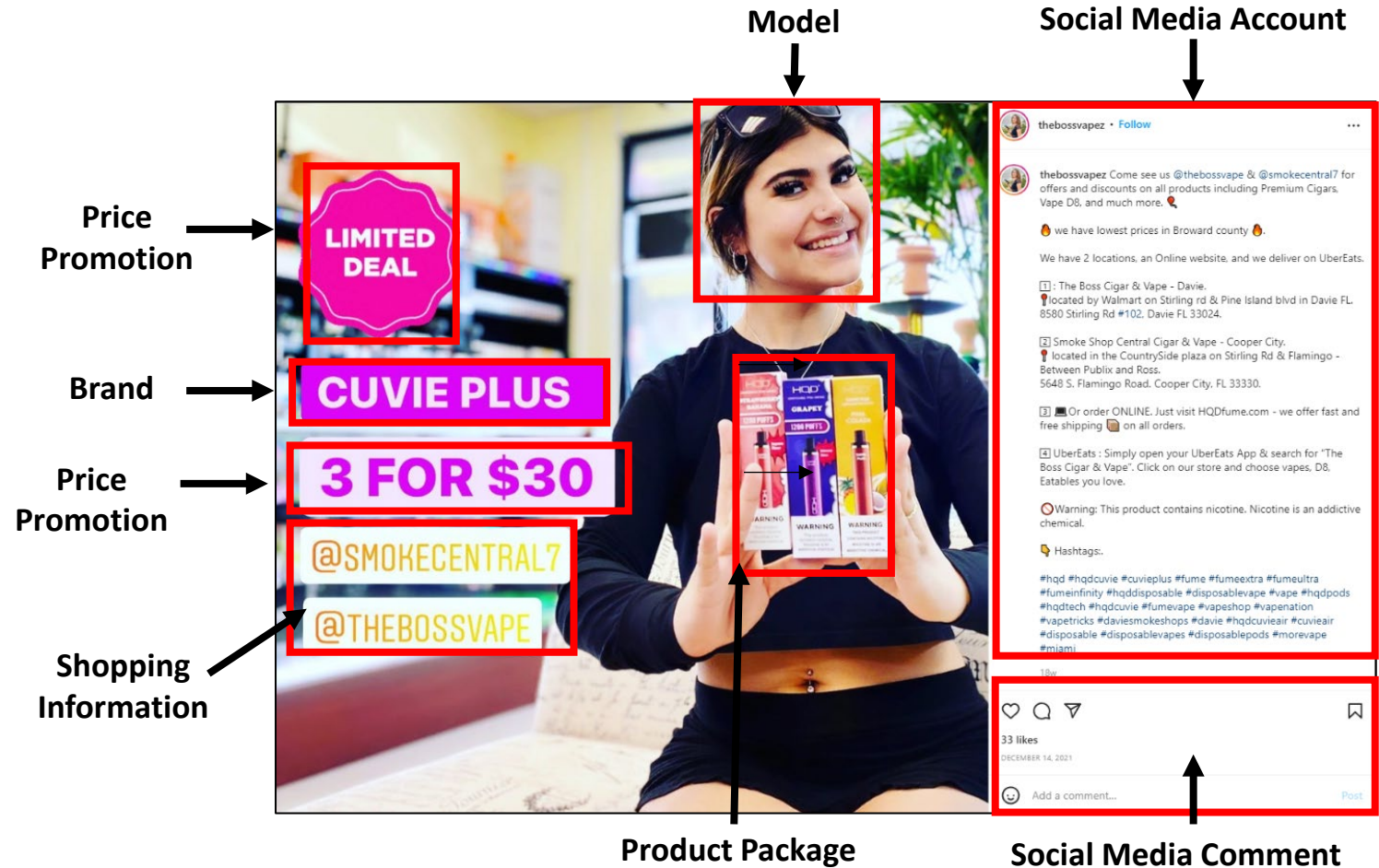
Social media account

Social media comment

Study 5 Methods

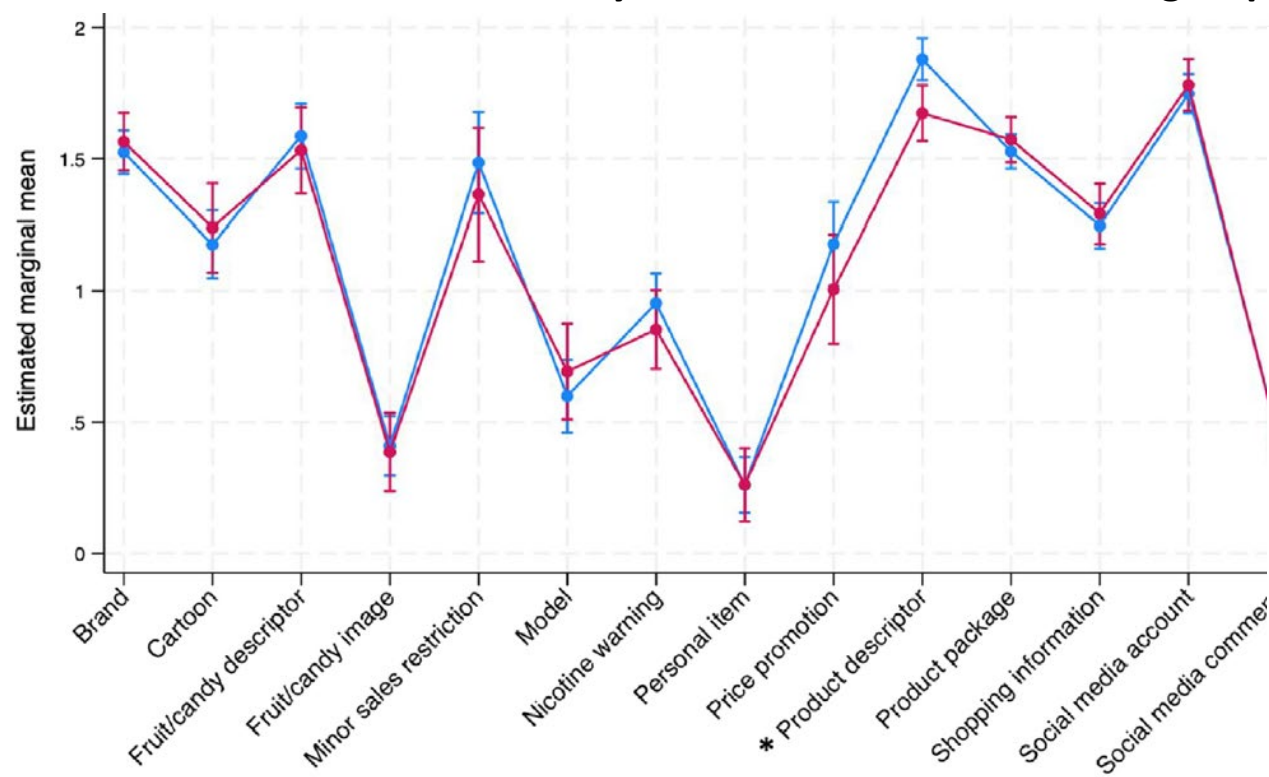
- **Study population:** young adults who do not use tobacco ($n=72$) and young adults who smoke cigarettes ($n=42$), recruited from social media platforms
- **Study procedures:**
 - Participants viewed 32 disposable e-cigarette marketing post images from Instagram as an eye-tracking device (Tobii Fusion) tracked their eye movements
 - Participants completed a post-exposure survey
- **Measures**
 - Eye-tracking measures for each predetermined AOI: **dwelt time (fixation duration)** and **entry time (time to first fixation)**
 - **Self-reported positive perceptions:** product appeal and positive use expectancies of the e-cigarettes shown in the ads

Example of e-cigarette ad labeled with areas of interest



Study 5 Results

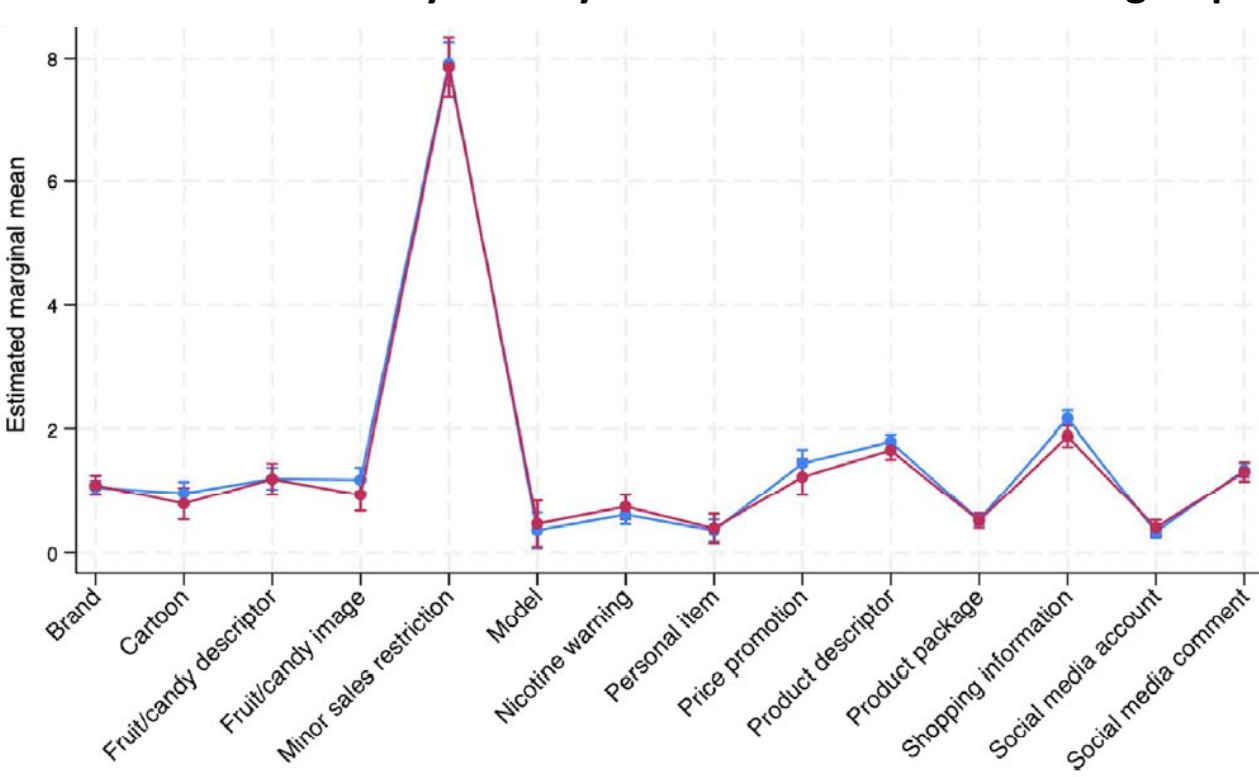
Standardized dwell time by ad feature and tobacco use group



Ad Feature

- Those who do not use tobacco
- Those who smoke
- * Signifies statistical difference by tobacco use status

Standardized entry time by ad feature and tobacco use group



Ad Feature

Study 5 Results

- Longer dwell time for **product package** increased positive product perceptions among both groups
- Longer dwell time for **fruit/candy flavor descriptors** and **price promotions** increased positive product perceptions among those who smoke



Product Package



Fruit/candy Descriptor



Price Promotion

Study 6

Impact of Brief E-cigarette Ads Featuring Fruit Flavors on Young Adults Across Tobacco-Use Statuses

Chen-Sankey J, La Capria K. Impact of Brief E-cigarette Ads Featuring Fruit Flavors on Young Adults Across Tobacco-Use Statuses (manuscript in progress)

High-Impact Fruit Flavor Features

- Identified by previous studies:
 - o Fruit flavor name (*e.g., strawberry, melon*)
 - o Product color that corresponds with the flavor name (*e.g., green for apple, yellow for pineapple*)
 - o Flavor image (*e.g., fruit image*)
 - o Flavor sensation descriptor (*e.g., refreshing, sweet, tasty*)
 - o Flavor choice claim
- o Strawberry flavor: the most common fruit flavors used in e-cigarettes



Example e-cigarette ad

Study 6 Methods

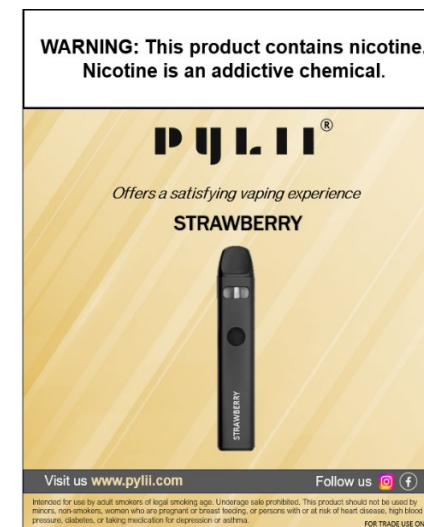
- **Study population:** three groups of young adults (ages 18-30)
 - o Who do not use tobacco (non-use group; $n=1,078$)
 - o Who smoke cigarettes but do not use e-cigarettes (cigarette-only group; $n=1,005$)
 - o Who smoke cigarettes and use e-cigarettes (dual-use group; $n=1,000$)
- **Randomized controlled experiment:**
 - o Participants recruited from Qualtrics were randomly assigned to briefly view one fictional e-cigarette ad with high-impact flavor features under six conditions
 - o Participants responded to post-exposure questions related to product perceptions and use intentions

ClinicalTrials.gov registration (NCT04906148)

Condition 1 (control): product with muted color and tobacco flavor name



Condition 2: product with muted color and strawberry flavor name



Condition 3: product with color and strawberry flavor name



Condition 4: condition 3 features + strawberry image



Condition 5: condition 4 features + flavor sensation descriptor



Condition 6: condition 5 features + flavor choice claim



Study 6 Results

- **Use intention:** Conditions 2-6 were associated with higher product use intention among the dual-use group (compared to the control)
- **Switching intention:** Conditions 4-6 were associated with higher complete switching among the dual-use group (compared to the control)
- **Perceived ad appeal:** Conditions 3-6 were associated with higher ad appeal compared to the control condition among the dual-use group (compared to the control)
- **Sensory appeal:** Conditions 2-6 were associated with higher sensory appeal among all groups (compared to the control)
- **Risk perceptions:** No experimental impact across groups

Condition 1 (control): product with muted color and tobacco flavor name



Condition 4: condition 3 features + strawberry image



Condition 2: product with muted color and strawberry flavor name



Condition 5: condition 4 features + flavor sensation descriptor



Condition 3: product with color and strawberry flavor name



Condition 6: condition 5 features + flavor choice claim



ClinicalTrials.gov registration (NCT04906148)

Key Takeaways and Implications

Key Takeaways

- E-cigarette ad features influence product appeal and use interest differently
- Such influence shares many similarities across tobacco-use groups, and especially strong among dual-use group
- Features directly highlighting product benefits and functionalities were the most effective in shaping product-related perceptions among both users and non-users
 - Fruit flavor profile and sensation increased
 - Tobacco flavor profiles and descriptions reduced
 - Smoker-targeted claims reduced ads' perceived relevance and appeal among those who do not use tobacco
 - Positive experience claims (e.g., convenience, discreetness) increased switching interest among those who smoke
- Many attention-grabbing features were not necessarily associated with product perceptions
 - Models / people, personal items, and social media accounts
- Nicotine warnings consistently reduce use and switching intentions
- Price promotions consistently generated use interest, especially among young adults who smoke
- Survey, in-depth interview, and other neurocognitive assessments need to follow eye tracking

Policy Implications

- Regulatory challenges due to the similar impact of e-cigarette ad features across young adult tobacco-use groups
- Nicotine warnings and smoker-targeted claims may substantially reduce product appeal and use interest among young adults who do not use tobacco
- Limiting the exposure to fruit flavor-related ad features, price promotions, and positive experience claims among those who smoke cigarettes can increase product switching intentions, especially for dual users, and reduce unintended consequences
- FDA e-cigarette authorization: Tobacco or menthol flavor-related ad features do not appeal to young adults. Tobacco flavor-related features reduce appeal and use (or switching) interest
- Summary
 - E-cigarette marketing policies and product authorization need to carefully balance ad feature impact among young adults of various tobacco-use statuses
 - Limiting the exposure to e-cigarette ads among those who smoke cigarettes may help promote impactful ad features to enhance product switching and minimize unintended consequences

Future Research Directions

- Examine a broader range of e-cigarette ad features with strong policy implications
 - Assess the impact of a reduced exposure message and / or an FDA-authorization claim embedded in ads for FDA-authorized e-cigarettes

**WARNING: This product contains nicotine.
Nicotine is an addictive chemical.**

LOGIC POWER

Completely switching from using cigarettes to this product reduces exposure to harmful chemicals

This product has been authorized for sale by the U.S. Food and Drug Administration (FDA)



With a powerful, rechargeable battery, Logic Power offers a satisfying vaping experience

www.logicvape.us

**WARNING: This product contains nicotine.
Nicotine is an addictive chemical.**

VUSE VIBE

Completely switching from using cigarettes to this product reduces exposure to harmful chemicals

This product has been authorized for sale by the U.S. Food and Drug Administration (FDA)



With a powerful, rechargeable battery, Vuse Vibe offers a satisfying vaping experience

www.vusevapor.com

**WARNING: This product contains nicotine.
Nicotine is an addictive chemical.**

NJOY ACE

Completely switching from using cigarettes to this product reduces exposure to harmful chemicals

This product has been authorized for sale by the U.S. Food and Drug Administration (FDA)



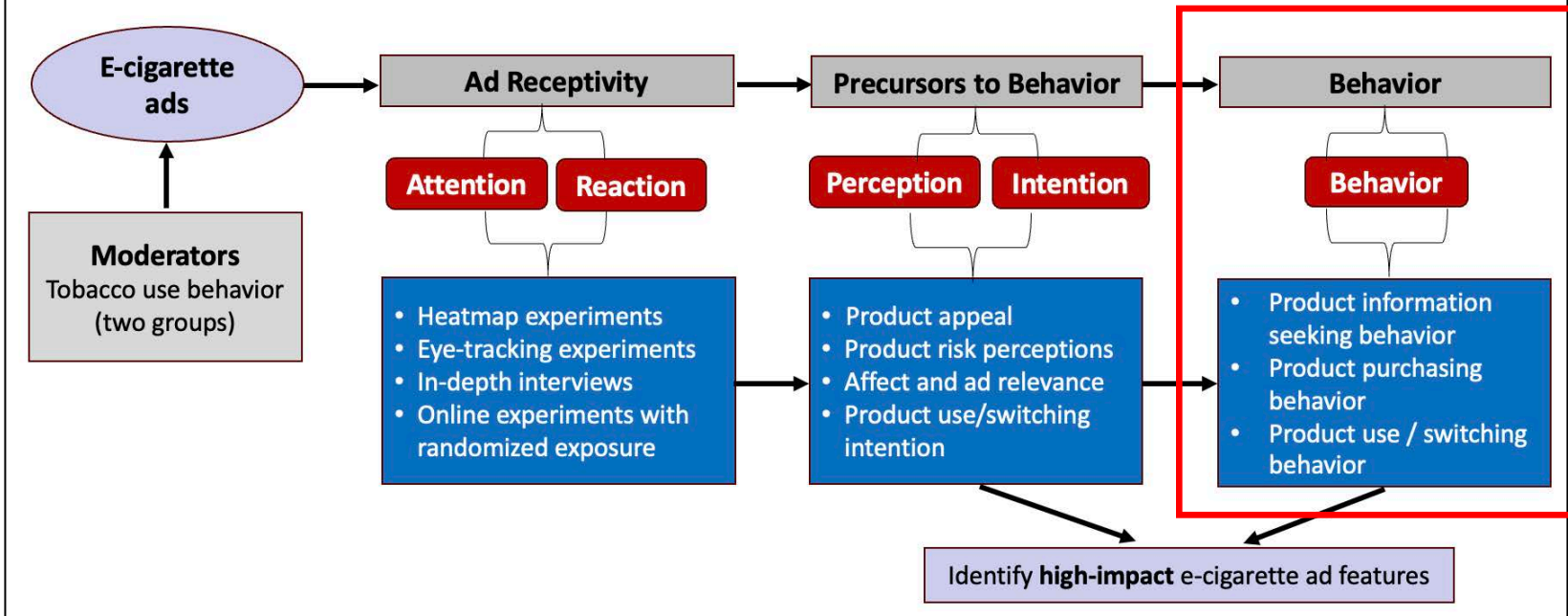
With a powerful, rechargeable battery, NJOY ACE offers a satisfying vaping experience

www.njoy.com

Future Research Directions (cont.)

- Using the methods to assess the impact of cannabis product marketing
- Investigating actual behavior change. Exploring the influence of ad features on product information seeking and sharing, purchasing, or use behavior using multiple time-point data collection

Message Impact Framework



Example of a cannabis ad from Stiizy

Acknowledgment

NIH Office of Disease Prevention, Tobacco Regulatory Science Program

National Cancer Institute, and Food and Drug Administration

National Institute on Minority Health and Health Disparities

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Rutgers School of Public Health**

Mentors, colleagues, and family

Contact Information
JC.Sankey@Rutgers.edu

Thank you!
Questions?