Supplementary Information Appendix

Overview

A) Study 1

Methods

Table S1 displays the full list of target Likes used in Study 1.

Table S1. Extraverted and introverted target Likes alongside the number and average personality scores of their followers in the myPersonality database.

Extraverted			Introverted		
Target Like	$\bar{z}_E$	n	Target Like	$\bar{z}_E$	n
Parties	0.62	904	Sanctuary	-0.25	424
Making People Laugh	0.56	483	Stargate SG1	-0.23	1,278
Meeting New People	0.56	1,106	Dark Angel	-0.20	409
Dancing	0.55	8,594	Stargate	-0.19	1,099
Shwayze	0.54	844	Serenity	-0.18	2,477
Entourage	0.54	1,934	Stargate Atlantis	-0.18	1,291
Rebelution	0.52	752	Battlestar Galactica	-0.16	2,399
Slightly Stoopid	0.50	2,322	Computers	-0.16	1,540
Mean	**0.54**	**10,917**	**Mean**	**-0.20**	**18,666**

Validation of Targeting Procedure. Using the same targeting procedure as described for Study 1, we ran a Facebook advertising campaign that invited users to take the 100-item IPIP personality questionnaire (1) with instant feedback on their scores. It was displayed in the News Feed and the right-hand advertising column. The ad is shown in Figure S1.

Figure S1. Ad used to recruit participants via Facebook advertising.

FREE Personality Test
concerto.e-psychometrics.com
Take this FREE Personality Test with instant
feedback and find out more about yourself!

From the 263,000 users in the extraverted target group and the 256,000 users in the introverted target group to which the ad was displayed, 479 and 563 users clicked on it respectively. The full 100-item IPIP questionnaire was completed by 59 introverted and 60 extraverted users (completion rate of 12% and 11%). For each user, we calculated the extraversion score by averaging the responses to the 20 extraversion items and z-standardizing the resulting raw scores across the whole sample of 119 participants. An independent t-test confirmed that participants who were targeted with extraverted Likes were significantly more extraverted than those targeted with introverted Likes ($t(117) = 4.29$, $p < .001$, $d = 0.79$ [0.41,1.16]). The results confirm that as little as one behavioral record is sufficient to target groups of different personality profiles with the help of existing behavioral targeting tools.

Table S2. Introverted and extraverted ads used in Study 1.

Introversion	Extraversion
Image accessible here: http://www.gettyimages.co.uk/license/137548001 Text: Beauty doesn't have to shout	Image accessible here: http://www.gettyimages.ca/license/476806075 Text: Dance like no one's watching (but they totally are)
Image accessible here: http://www.gettyimages.co.uk/license/488603139 Text: Uncover your natural beauty	Image accessible here: http://www.gettyimages.co.uk/license/476996977 Text: Bring out your best features and bring on the night
Image accessible here: http://www.gettyimages.ca/license/78767137 Text: Indulge your natural beauty	Image accessible here: http://www.gettyimages.co.uk/license/130899617 Text: Love the spotlight and feel the moment
Image accessible here: http://www.gettyimages.co.uk/license/496839201 Text: Find some time to feel yourself.	Image accessible here: http://www.gettyimages.co.uk/license/152415201 Text: Bold characters feel unique
Image accessible here: http://www.gettyimages.co.uk/license/184934575 Text: Beauty isn't always about being on show	Image accessible here: http://www.gettyimages.co.uk/license/130406597 Text: Love the spotlight

Table S3. Raw means for each of the ads and Big Five traits as rated by our samples of psychologists and laymen.

Ad	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Psychologist Sample (N = 16)					
Int1	-0.20	1.15	-1.05	0.70	-0.35
Int2	0.39	0.00	-1.56	0.61	-0.44
Int3	-0.25	1.05	-1.00	0.55	-0.75
Int4	0.00	1.50	-1.65	0.15	-0.30
Int5	0.15	1.00	-1.50	0.85	-1.35
Int Total	**0.02**	**0.94**	**-1.37**	**0.57**	**-0.64**
Ext1	1.05	-0.33	1.86	-0.24	0.62
Ext2	1.71	-1.05	2.62	0.24	0.25
Ext3	1.68	-1.21	2.58	0.84	0.21
Ext4	1.94	-0.78	2.39	0.78	0.22
Ext5	1.38	-0.05	2.38	0.29	-0.43
Ext Total	**1.55**	**-0.68**	**2.36**	**0.38**	**0.17**
Laymen Sample (N = 22)					
Int1	0.18	1.86	-0.59	1.05	-1.41
Int2	1.05	-0.05	-0.55	-0.18	-0.5
Int3	-0.36	1.45	-0.77	0.91	-1.41
Int4	0.26	2.26	-1.13	1.00	-1.09
Int5	-0.14	1.64	-0.64	1.00	-1.32
Int Total	0.20	1.43	-0.74	0.76	-1.15
Ext1	0.55	-0.23	1.32	-1.05	0.95
Ext2	1.95	-1.09	2.18	-0.18	0.45
Ext3	0.36	-0.68	2.05	0.14	0.09
Ext4	1.78	-0.74	2.35	0.64	-0.17
Ext5	0.36	0.41	1.59	0.41	0.36
Ext Total	1.00	-0.47	1.90	-0.01	0.34

Results

Table S4. Descriptive statistics across conditions, broken down by age.

Condition	Reach	Clicks	CTR	Conv	CR	CPConv	ROI
Introverted Ads congruent	762,197	2,637	0.35%	121	0.016%	£7.80	409%
Age							
18-24	426,453	1,396	0.33%	63	0.015%	£7.48	378%
25-34	219,651	799	0.36%	40	0.018%	£7.37	444%
35-44	116,093	442	0.38%	18	0.016%	£9.92	436%
Introverted Ads incongruent	791,270	2,426	0.31%	90	0.011%	£10.41	300%
Age							
18-24	425,140	1,293	0.30%	40	0.009%	£11.21	327%
25-34	252,657	784	0.31%	38	0.015%	£8.65	307%
35-44	113,473	349	0.31%	12	0.011%	£13.33	212%
Extraverted Ads congruent	814,308	2,573	0.32%	117	0.014%	£8.32	410%
Age							
18-24	440,748	1,372	0.31%	72	0.016%	£6.65	472%
25-34	254,684	798	0.31%	31	0.012%	£10.27	360%
35-44	118,876	403	0.34%	14	0.012%	£12.60	332%
Extraverted Ads incongruent	762,218	2,710	0.36%	62	0.008%	£15.93	219%
Age							
18-24	411,739	1,351	0.33%	34	0.008%	£13.66	229%
25-34	233,349	890	0.38%	22	0.009%	£15.74	219%
35-44	117,130	469	0.40%	6	0.005%	£29.45	191%

Note. CTR = Click-through rate, Conv = Conversions, CR = Conversion rate, CPConv = Cost per conversion, ROI = Return-on-Investment

Table S5. Descriptive statistics across conditions, broken down by target group and individual ad creatives.

Target Group	Ad	Condition	Reach	Clicks	CTR (in %)	Conv	CR (in %)	CPConv (in £)	ROI (in %)
Int	Int 1	congruent	157,980	605	0.38%	42	0.027%	4.63	652
Int	Int 2	congruent	144,545	467	0.32%	18	0.012%	9.94	302
Int	Int 3	congruent	143,689	458	0.32%	10	0.007%	18.06	279
Int	Int 4	congruent	164,779	543	0.33%	14	0.008%	13.59	230
Int	Int 5	congruent	151,204	564	0.37%	37	0.024%	5.40	558
Int	Ext1	incongruent	159,951	567	0.35%	11	0.007%	17.94	200
Int	Ext 2	incongruent	152,647	616	0.40%	13	0.009%	15.36	236
Int	Ext 3	incongruent	144,147	506	0.35%	16	0.011%	12.31	284
Int	Ext 4	incongruent	152,563	522	0.34%	10	0.007%	20.00	143
Int	Ext 5	incongruent	152,910	499	0.33%	12	0.008%	16.12	232
Ext	Int 1	incongruent	157,229	482	0.31%	11	0.007%	17.31	160
Ext	Int 2	incongruent	155,993	481	0.31%	31	0.020%	6.16	582
Ext	Int 3	incongruent	157,349	460	0.29%	12	0.008%	16.01	154
Ext	Int 4	incongruent	160,466	559	0.35%	15	0.009%	13.14	256
Ext	Int 5	incongruent	160,233	444	0.28%	21	0.013%	7.93	360
Ext	Ext 1	congruent	163,862	546	0.33%	25	0.015%	7.88	438
Ext	Ext 2	congruent	160,146	615	0.38%	22	0.014%	9.05	485
Ext	Ext 3	congruent	164,003	436	0.27%	24	0.015%	7.62	422
Ext	Ext 4	congruent	160,963	479	0.30%	19	0.012%	10.50	276
Ext	Ext 5	congruent	165,334	497	0.30%	27	0.016%	7.21	432

Note. Ext = Extraversion, Int = Introversion. CTR = Click-through rate, Conv = Conversions, CR = Conversion rate, CPConv = Cost per conversion, ROI = Return-on-Investment

Fig. S2. Interaction effects of audience and ad personality on Click-Through Rates (total N = 3,129,993)
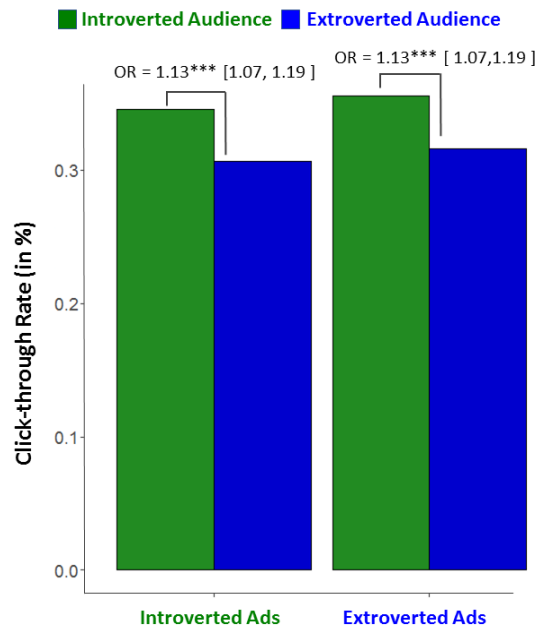

Table S6. Results of two hierarchical logistic regression analyses on CTR and CR.

	Click-Through Rate (CTR)					
	Model 1			Model 2		
	B	SE(B)	z	B	SE(B)	z
Target Group	-0.12***	0.03	-4.30	-0.12***	0.03	-4.34
Ads	0.03	0.03	1.00	0.11	0.03	0.35
Target Group × Ads	0.003	0.04	0.07	-0.04	0.04	-1.12
Age						
25-34	-	-	-	0.06*	0.03	-2.02
35-44	-	-	-	0.09*	0.04	-2.15
Ads × 25-34	-	-	-	0.02	0.04	0.37
Ads × 35-44	-	-	-	0.06	0.05	1.02
	Conversion Rate (CR)					
	Model 1			Model 2		
	B	SE(B)	t	B	SE(B)	t
Target Group	-0.33*	0.14	-2.40	-0.34*	0.14	-2.47
Ads	-0.67***	0.16	-4.28	-0.46*	0.18	-2.54
Target Group × Ads	0.90***	0.21	4.30	0.91***	0.21	4.34
Age						
25-34	-	-	-	0.32*	0.15	2.12
35-44	-	-	-	0.08	0.21	0.36
Ads × 25-34	-	-	-	-0.46*	0.23	-2.05
Ads × 35-44	-	-	-	-0.45	0.32	-1.41

Note. The reference categories for Target Group and Ads are 'Introverted'. The reference category for Age is 18-24.

B) Study 2

Methods

Table S7. Target Likes for low and high openness alongside the number and average personality scores of their followers in the myPersonality database.

High Openness			Low Openness		
Target Like	$\bar{z}_O$	n	Target Like	$\bar{z}_O$	n
Waking Life	0.78	883	Farm Town	-0.59	1,094
Film	0.63	628	Bubble Popp	-0.57	589
Philosophy	0.62	3,669	Uncle Kracker	-0.55	427
Thelonious Monk	0.61	533	NCIS: LA	-0.49	1,343
The Fountain	0.59	1,172	My Town	-0.49	1,097
Siddhartha	0.57	701	Island Paradise	-0.48	1,238
Astrology	0.55	525	MindJolt Games	-0.47	2,391
Meditation	0.54	923	Watching TV	-0.47	1,719
Poetry	0.53	3,734	My City Life	-0.47	597
The Fall	0.51	443	Scary Movie	-0.47	438
Mean	**0.59**	**13,211**	**Mean**	**-0.51**	**10,933**

Targeting Procedure.

We used the same targeting procedure as outlined in Study 1. It is noteworthy that the two matching ad sets were shown to users much more frequently than their two mismatching counterparts initially. Assuming that the Facebook advertising algorithm prioritizes high-performing ads, this finding can be taken as additional support for our matching hypothesis. However, in order to achieve a more balanced experimental design (with a comparable number of impressions across ad sets), we made minor adjustments to the bidding procedure throughout the campaign. For each adjustment, we tested whether the change had a noticeable impact on the key outcomes of click-through and conversion rates to avoid biases. The fact that none of the adjustments did have a substantial impact further underlines the robustness of effects.

Table S8. Raw means for each of the ads and Big Five traits, as rated by our online panel

Ad	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
LO	3.09	5.82	2.45	3.68	2.68
HO	5.00	2.91	5.41	4.14	4.50

Results

Table S9. Descriptive stastics across conditions, broken down by age and gender.

Condition	Reach	Clicks	CTR	Conv	CR	CPConv
LO Ads congruent						
Age						
18-24	3,779	42	1.11%	27	0.71%	$1.59
25-34	5,320	75	1.41%	50	0.94%	$1.26
35-44	4,172	64	1.53%	39	0.93%	$1.36
45-54	3,027	66	2.18%	30	0.99%	$1.57
55-64	1,343	39	2.90%	21	1.56%	$1.12
65+	569	10	1.76%	7	1.23%	$1.58
Gender						
Female	14,170	224	1.58%	137	0.97%	$1.37
Male	4,040	72	1.78%	37	0.92%	$1.41
LO Ads incongruent						
Age						
18-24	9,393	66	0.70%	34	0.36%	$2.08
25-34	6,500	69	1.06%	35	0.54%	$1.59
35-44	4,190	37	0.88%	22	0.53%	$1.72
45-54	3,726	51	1.37%	28	0.75%	$1.52
55-64	2,495	39	1.56%	17	0.68%	$2.07
65+	1,459	33	2.26%	13	0.89%	$1.58
Gender						
Female	21,508	223	1.04%	116	0.54%	$1.78
Male	6,255	72	1.15%	33	0.53%	$1.69
HO Ads congruent						
Age						
18-24	7,217	69%	0.96	24	0.33%	$2.72
25-34	7,809	105%	1.34	42	0.54%	$1.93
35-44	6,595	105%	1.59	34	0.52%	$1.93

45-54	4,377	75%	1.71	25	0.57%	$2.30
55-64	2,131	50%	2.35	10	0.47%	$3.27
65+	1,148	23%	2.00	5	0.44%	$3.74
Gender						
Female	24,440	357%	1.46	117	0.48%	$2.29
Male	4,837	70%	1.45	23	0.48%	$2.28
HO Ads incongruent						
Age						
18-24	1,565	14%	0.89	5	0.32%	$2.91
25-34	2,505	24%	0.96	12	0.48%	$2.15
35-44	2,024	25%	1.24	4	0.20%	$5.28
45-54	1,569	26%	1.66	6	0.38%	$3.27
55-64	884	16%	1.81	6	0.68%	$2.00
65+	379	7%	1.85	4	1.06%	$1.78
Gender						
Female	7,178	100%	1.39	35	0.49%	$2.31
Male	1,748	12%	0.69	2	0.11%	$9.68

Figure S3. Interaction effects of audience and ad personality on Click-Through Rates (total N = 84,176).
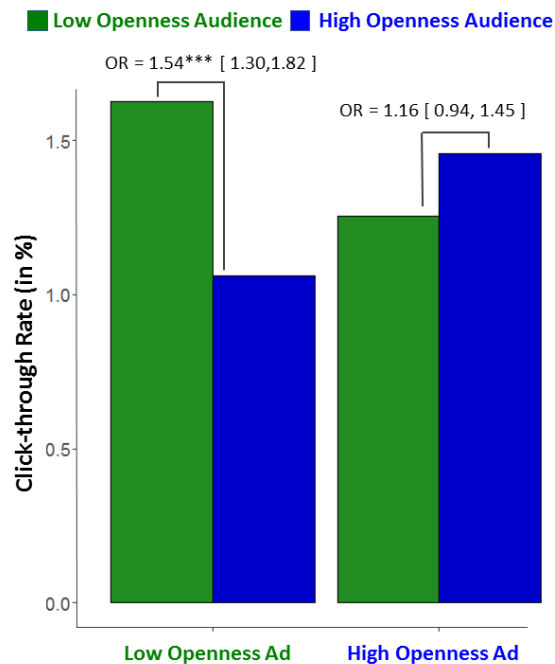
Table S10. Results of two hierarchical logistic regression analyses on CTR and CR.

	Click-Through Rate (CTR)					
	Model 1			Model 2		
	B	SE(B)	z	B	SE(B)	z
Target Group	-0.43***	0.08	-5.20	-0.42	0.08	-4.96
Ads	-0.26*	0.11	-2.35	-0.26	0.18	-1.45
Target Group × Ads	0.58***	0.14	4.32	0.61***	0.14	4.47
Age						
25-34	-	-	-	0.32*	0.13	2.49
35-44	-	-	-	0.29*	0.14	2.06
45-54	-	-	-	0.68***	0.14	5.02
55-64	-	-	-	0.89***	0.15	5.92
65+	-	-	-	0.96***	0.18	5.26
Gender	-	-	-	0.08	0.10	0.79
Ads × 25-34	-	-	-	-0.02	0.19	-0.10
Ads × 35-44	-	-	-	0.21	0.20	1.03
Ads × 45-54	-	-	-	-0.06	0.20	-0.30
Ads × 55-64	-	-	-	-0.01	0.22	-0.28
Ads × 65+	-	-	-	-0.19	0.28	-0.67
Ads × Gender	-	-	-	-0.26	0.16	-1.66

	Conversion Rate (CR)					
	Model 1			Model 2		
	B	SE(B)	z	B	SE(B)	z
Target Group	-0.58***	0.11	-5.19	-0.55***	0.11	-4.87
Ads	-0.84***	0.18	-4.63	-0.82**	0.29	-2.89
Target Group × Ads	0.72***	0.22	3.35	0.72***	0.22	3.32
Age						
25-34	-	-	-	0.35*	0.17	2.10
35-44	-	-	-	0.34	0.18	1.87
45-54	-	-	-	0.53**	0.19	2.88
55-64	-	-	-	0.73***	0.21	3.52
65+	-	-	-	0.77**	0.26	2.98
Gender	-	-	-	-0.08	0.14	-0.56
Ads × 25-34	-	-	-	0.13	0.29	0.45
Ads × 35-44	-	-	-	-0.03	0.32	-0.09
Ads × 45-54	-	-	-	-0.05	0.32	-0.15
Ads × 55-64	-	-	-	-0.23	0.38	-0.60
Ads × 65+	-	-	-	-0.16	0.46	-0.35
Ads × Gender	-	-	-	-0.18	0.25	-0.70

Note. The reference categories for Target Group and Ads are 'Introverted'. The reference category for Age is 18-24 years.

C) Study 3

Methods

Table S11. Raw means for each of the ads and Big Five traits, as rated by our online panel.

Ad	Openness	Conscientiousness	Extraversion	Agreeableness	Neuroticism
Standard	4.54	2.90	5.59	4.05	5.04
Tailored	3.77	3.32	4.38	3.91	4.09

Results

Online Experiment. To rule out the possibility that the personality-tailored ad was simply more appealing and effective overall, we conducted an experiment on Amazon Mechanical Turk. The survey was completed by 98 workers. We excluded one worker who had not passed the attention check, which left us with 97 valid responses (average age = 35.34, 50% female). Participants indicated their opinions about the standard and the personality-tailored ad copy using a five-point scale from 1 = Strongly Disagree to 5 = Strongly Agree. We used the following four questions: "I find this ad to be persuasive", "Overall, I like this ad", "I'm interested in learning more about the app after seeing this ad", and "This is an effective ad" (adapted from , 2). With an average Cronbach's alpha of α = 0.94 across the two ads, the scale reliability of our preference measure was found to be excellent. Participants subsequently completed the BFI, an established measure of the five factor Model of personality (3).

We used linear regression to predict participants' attitudes about the two ads from participants' dichotomized extraversion level (0 = introverted 1 = extraverted), the ad copy (0 = introverted, 1 = standard), as well as their two-way interaction. The average ratings across the four conditions are shown in Figure S5.

Figure S4. Average ratings across the four conditions (total N = 97). The error bars indicate the standard error of measurement (SEM).
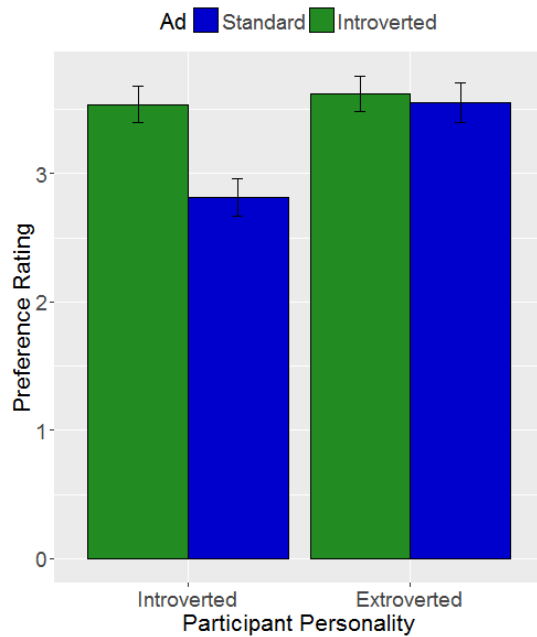

Table S11 displays the results of the linear regression analysis. The analysis revealed a significant main effect of the ad design, such that the personality-tailored ad was perceived as significantly more appealing and effective than the standard ad. However, as the significant interaction effect as well as Figure S6 illustrate, this effect was almost exclusively driven by introverted participants. While introverted participants showed a significant preference for the introverted ad ($t(94) = 3.55$, $p < 0.001$), there was no significant preference among extraverted participants ($t(96) = 0.35$, $p = 0.727$). The findings indicate that the results obtained from the Facebook campaigns and presented in the main manuscript are unlikely to be explained by the fact that the introverted ad was generally more appealing than the extraverted ad.

Table S12. Results of a linear regression analysis of participant extraversion, ad copy as well as their interaction on participants' preference ratings.

	B	SE(B)	z
Participant Extraversion	0.09	0.20	-3.52
Ad	-0.72***	0.20	0.42
Participant Extraversion × Ad	0.65*	0.29	2.26

The reference ad is 'Introverted'.

## D) Evidence for the scalability of our psychological targeting approach

We conducted additional analyses on all five personality traits in the five factor Model (4, 5) to explore the potential scope and scalability of psychological targeting by testing the predictive accuracy of individual target Likes in a hold-out validation procedure that resembles a real-life targeting setting.

Method

Dataset and Analysis. We used the latest datasets made available on myPersonality.org in November 2015 and selected Facebook Likes that were followed by at least 50 U.S. Facebook users who had completed the full 100-item IPIP questionnaire (1). This left us with 32,712 unique Likes from 73,085 users (12,507,096 unique user-Like pairs). In order to obtain two independent samples, we randomly split the dataset into two subsamples (subsample A = 36,570 consumers, subsample B = 36,515 consumers). Each of the datasets was subsequently used as both a training and testing dataset (Fold 1: A = training, B = testing; Fold 2: B = training, A = testing). For each of the two folds, the validation procedure developed in three steps (see Figure S6 for a visual illustration of Fold 1). First, we used the training sample to calculate the average personality profiles of all Likes by averaging the z-standardized scores on each of the five personality traits across all participants in our sample who had endorsed the particular Like. Similar to Study 1, the personality profile of the Facebook Like "Lady Gaga" therefore describes the average personality profile of consumers in our sample who followed her Page. Second, we looked at the individual user-Like pairs in our testing dataset and compared the predicted personality of the user (based on the Like personality) with their actual self-reported personality. All user-Like pairs for which the predicted personality matched the actual personality were classified as "correctly targeted." Third, for each Like and personality trait, we calculated the percentage of participants classified as "correctly targeted" as the fold-specific classification accuracy. The following example describes the procedure for the trait of openness and a single Facebook Like. Let us assume, for example, that we calculated an average openness score of $\bar{z}_O = .50\sigma$ for the Facebook Like "Lady Gaga" in the training sample. Given that the openness score was above average ($\bar{z}_O = .50\sigma > 0$), the Facebook Like "Lady Gaga" can be considered as a target Like for high openness (Step 1). Next, we compared the actual personality scores of all the users who have liked "Lady Gaga" in our testing sample to the prediction made by the target Like. In the case of the Facebook Like "Lady

Gaga" (high openness), all participants whose z-scores were above the average openness score ($z_O > 0$) were classified as "correctly targeted," while all participants whose z-scores were below the average openness score ($z_O < 0$) were classified as "incorrectly targeted" (Step 2). Finally, we calculated the classification accuracy of the Like "Lady Gaga" as the proportion of participants classified as "correctly targeted" relative to the total number of participants who were associated with this Like (Step 3).

Figure S5. Hold-out validation procedure (Fold 1) used to determine the classification accuracy of all 32,712 Facebook Likes.
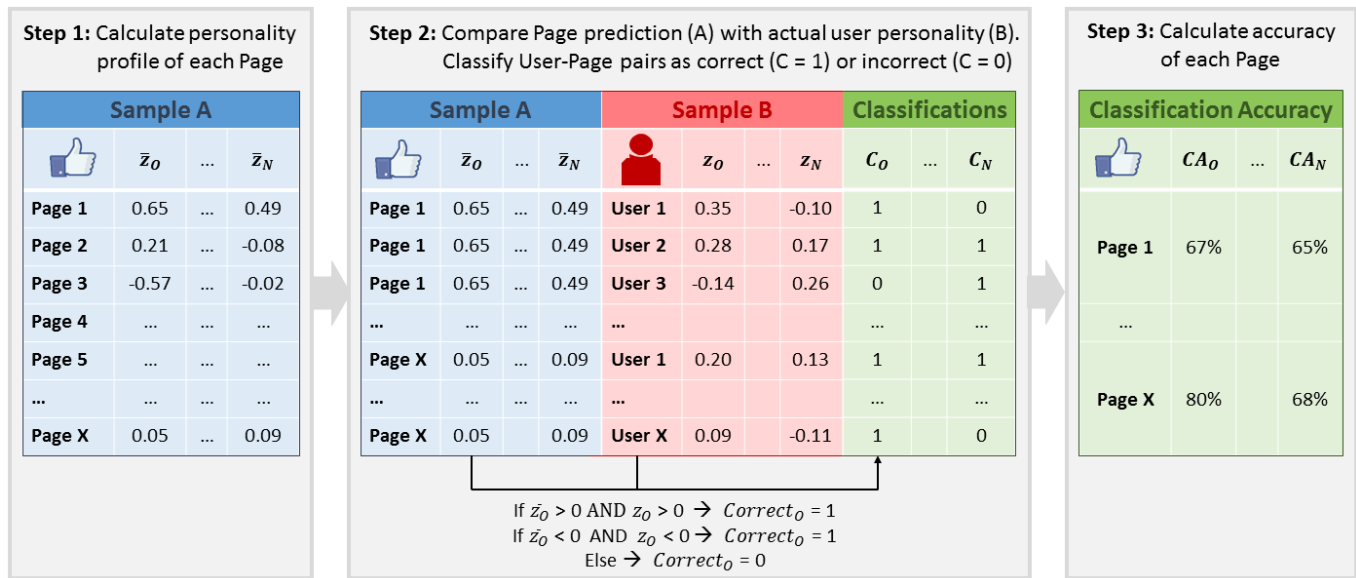
One of the defining features of Facebook Likes in the context of classification accuracy is their level of discriminative power, which is equal to their absolute average z-score. For example, one would expect a Facebook Like with an average extroversion z-score of $\bar{z}_E = .50\sigma$ to be more effective in defining an extroverted target group than a Facebook Like with an average extroversion z-score of $\bar{z}_E = 0.20\sigma$. Similarly, one would expect a Facebook Like with an average extroversion z-score of $\bar{z}_E = -.50\sigma$ to be more effective in defining an introverted target group than a Facebook Like with an average extroversion z-score of $\bar{z}_E = -0.20\sigma$. Therefore, taking the absolute value of the personality z-scores associated with a Facebook Like provides an indication of its level of discriminative power: The higher the absolute z-score, the better the Like should be at discriminating between consumers that are high and low on the trait. In order to investigate the classification accuracy of Facebook Likes at different levels of discriminative power, we binned

all of the 32,712 Facebook Likes in our sample according to their average absolute trait score, rounded to the closest decimal point. The bin $|\bar{z}_o| = 0.8\sigma$, for example, contained all Likes with an average openness score of $0.75 \geq |\bar{z}_o| > 0.85\sigma$, as well as all Likes with an average openness score of $-0.85 \geq |\bar{z}_o| > -0.75\sigma$.

Results

Figure S7 displays the classification accuracy of Facebook Likes (Y-axis) dependent on their level of discriminative power (X-axis; see web appendix G for exact values). A classification accuracy of 50% is the level of chance. As expected, the classification accuracy of Facebook Likes increases significantly with their level of discriminative power. While the average classification accuracy across all traits is only 58% for Likes with a discriminative power of .02, it goes up to 69% for Likes with a discriminative power of 0.8. Importantly, however, there are considerable differences in the classification accuracy between personality traits. While openness was found to be the most successful in targeting participants outside of the training sample (maximum classification accuracy of 82%), agreeableness was found to be the least successful (maximum classification accuracy of 61%). In line with research on the predictability of personality traits from whole user profiles (*7*, *10*), this finding suggests that some traits can be predicted more successfully from digital footprints than others.

Figure S6. Relationship between the cross-validated classification accuracy (Y-axis) and the levels of target Likes' discriminative power (total N = 73,085). Facebook Likes were binned by their average absolute trait score, rounded to the closest decimal point.
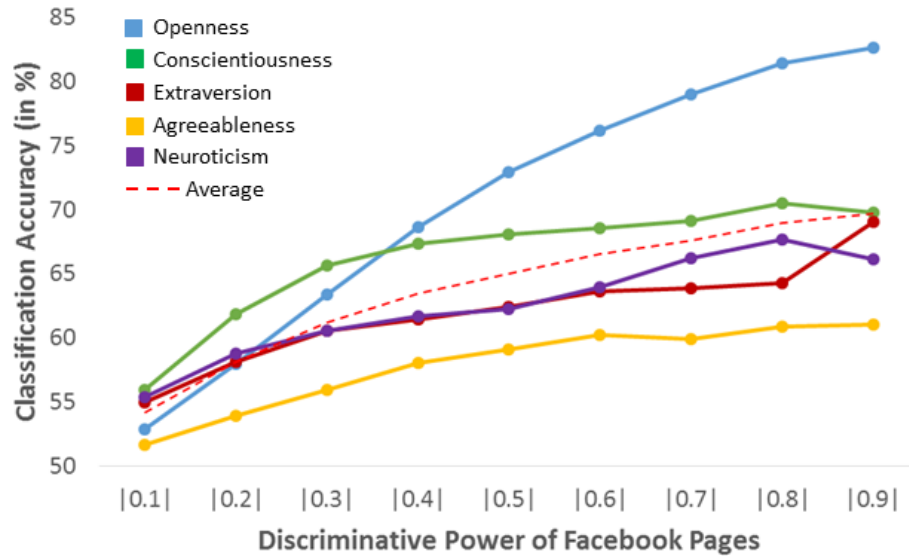
Taken together, these findings suggest that it is feasible to implement personality targeting on a scale that is much larger than what has been empirically demonstrated in Studies 1–3 (e.g., using different personality traits and Likes of varying discriminant power). However, it is important to take a closer look at the potential limits in scalability. Indeed, while an increase in the level of discriminative power results in a higher targeting accuracy of Likes across all traits, it limits the number of Likes that can be used for targeting. In order to examine this inverse relationship, we calculated the number of Facebook Likes at every level of discriminative power. Figure S8 illustrates the trade-off between accuracy and reach by plotting the average level of accuracy (Y-axis) against the relative number of Likes available for targeting (X-axis). For example, while on average 26% of Facebook Likes have a discriminative power of $|\bar{z}| = .30$, only 2.5% of Likes have a discriminative power of $|\bar{z}| = .60$.

Although a high level of discriminative power thus allows marketers to increase their level of accuracy when targeting consumers of different personalities, it simultaneously reduces the pool of consumers that can be targeted. The optimum balance between accuracy and reach likely depends on a marketing campaign's specific requirements. If it is essential to reach a large number of consumers, marketers might need to lower their level of accuracy. However, if the priority is to

maximize targeting accuracy, the potential reach of campaigns might be restricted to a smaller number of consumers. Given the enormous size of Facebook, however, a relatively small number of Likes can often be sufficient to target a fairly large number of consumers. Even though Study 1 only used eight target Likes, for example, the estimated audience size was N = 6,000,000 in each of the groups.

Figure S7. Trade-off between the accuracy and availability of target Likes at different levels of discriminant power.

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