

# A critique of “Loyalty to computer terminals: is it anthropomorphism or consistency?”

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1. Identify main concepts and research questions
2. Description of methods
3. Interpretation of results
4. Critique of methods
5. Discussion

A study in two parts exploring long-term social interactions ("psychological partnerships") with public computer terminals.

Study one observed individuals' patterns of computer lab use via electronic access logs to assess latent behavioral loyalty to terminals, hypothesizing that students using campus computer labs will frequent the same terminals during subsequent visits.

Study two implemented surveys to discern between conscious preferences for consistency and tendencies towards anthropomorphism when selecting terminals.

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## Concept and Research Questions

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*Operationalized behaviorally* as **reinforcing loyalty**, the tendency to repeatedly switch among product alternatives, and **hard-core loyalty**, the repeat selection of a single product alternative.

*Operationalized attitudinally* as **psychological anthropomorphism** and **consistency**.

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Study two measures **consistency** using an adopted 18-item, 7-point interval scale — "strongly agree" to "strongly disagree".

**RQ1:** For college students, what is the relationship between degree of preference for consistency and degree of expressed behavioral loyalty to computer terminals?

**RQ2:** For college students, what is the relationship between degree of anthropomorphizing tendency and degree of expressed behavioral loyalty to computer terminals?

## Methods

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The author used terminal access logs to observe student usage patterns in 18 public, general-purpose computer labs for 30 days.

Course-related lab usage was systematically excluded from analysis to account for individual student usage.

In total, 42,845 users visited 871 different terminals for a total of 210,283 visits.

Busy labs required a shift in study design to account for preferred but in-use terminals. The dataset was reorganized as two measures per user: (1) the number of visits per user, and (2) the number of different computers visited.

Although the results from this study showed support for loyalty to certain terminals, this could be attributed to an alternative explanation of “preference for consistency” (rather than anthropomorphizing tendencies).

A paired  $t$ -test was performed for each of the 18 labs to compare the means of these two measures, risking possible inflation of family-wise type 1 error caused by multiple comparisons.

Applying a Bonferroni correction (dividing type 1 error rate by the number of comparisons) yielded an  $\alpha$  of 0.0027 (0.05/18).

$p$ -values for each of the 18  $t$ -tests should be less than or equal to 0.0027 for  $t$  to be significant.

Study 2 implemented a survey to assess attitudinal components of loyalty.

191 respondents were sampled. Participants included 104 (54.5%) males and 79 (41.4%) females with an average age of 22. 8 respondents did not provide demographics.

42 of 163 (25.8%) said they preferred one particular terminal (hardcore-loyalty), while reinforcing-loyalty likelihood had a mean average of 7.56 (SD=2.99) on the 10-point scale.

180+ respondents completed the 12 item anthropomorphism scale with item means ranging from 3.85 to 7.40 on the 10-point scale.

180+ respondents completed the 18 item consistency scale with item means ranging from 3.18 to 5.95 on a 7-point scale of agreement.

The anthropomorphism and consistency scales were highly reliable (Cronbach's  $\alpha$  0.87 and 0.89, respectively), allowing items to be additively combined into a anthropomorphism index and a consistency index.

The **hardcore-loyalty variable** was entered as a DV (1 or 0) in a logistic regression with both indices serving as continuous regressors. Both were positive predictors of hardcore loyalty: higher scores independently increasing the odds of expressing hardcore loyalty.

To compare the anthropomorphism and consistency means between hardcore-loyal and non-hardcore-loyal groups, a set of *t*-tests was performed as a follow-up analysis.

With the anthropomorphism index as DV, significant differences were found between the means of those who expressed hardcore loyalty ( $M=6.29$ ,  $SD=2.06$ ) and those who did not ( $M=5.21$ ,  $SD=1.88$ ),  $t(151)=3.01$ ,  $p<0.01$ .

With the consistency index as DV, significant differences were found between means of those who expressed hardcore loyalty ( $M=5.20$ ,  $SD=0.81$ ) and those who did not ( $M=4.80$ ,  $SD=0.82$ ),  $t(151) = 2.63$ ,  $p<0.01$ .

Neither index was found to be statistically significant after a multiple regression was performed with both indices as predictors of the **reinforcing-loyalty measure**.

To explore non-linear relationships, the two continuous-variable indices were reduced to a three-category ordinal variable (low/medium/high anthropomorphism, low/medium/high consistency).

A one-way ANOVA was performed on each of these reduced ordinal indices using the ratio-level reinforcing-loyalty measure as a DV.

Anthropomorphism as IV showed a significant effect,  $F(2,105) = 3.84$ ,  $p < 0.05$ . Means for low, medium, and high anthropomorphism categories were 7.31, 7.02, 8.81 respectively. A Tukey HSD *post-hoc* test showed a significant difference at  $p < 0.05$  between medium and high categories.

Consistency as IV was also significant,  $F(2,105) = 3.93$ ,  $p < 0.05$ . Means for low, medium, and high consistency categories were 6.52, 8.45, 7.74 respectively. A Tukey HSD *post-hoc* test showed a significant difference at  $p < 0.05$  between low and medium categories.

## Results

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# Study 1 Results

Table 2. Summary of *t*-tests

Labs	<i>n</i>	Number of visits		Number of different computers visited		<i>df</i>	<i>t</i>	<i>p</i>
Lab1	1376	M	4.3198	M	3.2115	1375	15.060	0.0001
		SD	5.0948	SD	2.8929			
Lab2	2266	M	5.3094	M	3.8447	2265	18.342	0.0001
		SD	6.9017	SD	3.6754			
Lab3	4642	M	3.4054	M	2.7867	4641	21.295	0.0001
		SD	4.1830	SD	2.6728			
Lab4	2401	M	4.2653	M	3.3136	2400	22.925	0.0001
		SD	4.4004	SD	2.8542			
Lab5	3564	M	7.4607	M	5.5216	3563	24.484	0.0001
		SD	10.2869	SD	5.6664			
Lab6	2133	M	4.8781	M	3.5354	2132	17.736	0.0001
		SD	6.0675	SD	3.1740			
Lab7	235	M	4.94	M	2.5915	234	7.380	0.0001
		SD	6.28	SD	2.0535			
Lab8	538	M	4.6803	M	3.0335	537	12.387	0.0001
		SD	4.8668	SD	2.3783			
Lab9	1113	M	5.7475	M	4.0961	1112	17.738	0.0001
		SD	5.8568	SD	3.3313			
Lab10	255	M	8.6941	M	4.6627	254	10.846	0.0001
		SD	8.7543	SD	3.6017			
Lab11	4452	M	3.3989	M	2.7653	4451	20.026	0.0001
		SD	4.1114	SD	2.5102			
Lab12	3574	M	5.3159	M	4.0680	3573	22.837	0.0001
		SD	6.5215	SD	3.8363			
Lab13	642	M	7.1838	M	4.5109	641	12.155	0.0001
		SD	8.9176	SD	3.9699			
Lab14	1910	M	2.9157	M	2.3277	1909	14.638	0.0001
		SD	3.1919	SD	1.8637			
Lab15	3600	M	3.5964	M	2.8853	3599	20.245	0.0001
		SD	4.1905	SD	2.6703			
Lab16	1635	M	7.9076	M	4.6813	1634	17.635	0.0001
		SD	11.1791	SD	4.5606			
Lab17	5619	M	6.3011	M	4.8347	5618	23.596	0.0001
		SD	9.6146	SD	5.6898			
Lab18	2890	M	3.4779	M	2.6983	2889	17.693	0.0001
		SD	4.2817	SD	2.4399			

The revised  $\alpha$  criterion was met in all cases, indicating statistical significance of each *t*-test

Table 5. Results of logistic regression with both anthropomorphism and consistency indices as IVs and the hardcore loyalty measure as the DV

Variable	B	Wald X <sup>2</sup>	Exp (B)	Odds Ratio	Rsquare change (U)
Anthropomorphism	0.19	3.57*	1.21	5.85	0.05
Consistency	0.56	4.69*	1.75	11.45	0.07

Note. Exp (B) is the multiplicative factor by which the odds of the dependent variable change as a function of a unit increase in the independent variable. Therefore, Exp (B) < 1 indicates a reduction in odds whereas Exp (B) > 1 indicates an improvement in odds (Norusis, 1992). The Odds Ratio column indicates the multiplicative factor by which the parameter estimate (i.e., B) would change as a function of the independent variable changing from its minimum to its maximum value (Hosmer and Lemeshow, 1989). The Rsquare, sometimes referred to as U, the uncertainty coefficient, is an indicator of model improvement, and ranges from zero for no improvement to 1 for a perfect fit. \* $p \leq 0.05$

Anthropomorphism more strongly predicted hardcore loyalty than consistency.

(As a measure of uncertainty, Rsquare is often low given nominal responses.)



Table 6. Results of one-way ANOVA with anthropomorphism index as the IV and reinforcing loyalty measure as the DV

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Low anthropomorphism	38	7.31	3.49	3.84	0.02
Medium anthropomorphism	38	7.02	2.79		
High anthropomorphism	32	8.81	1.87		
Total	108	7.56	2.99		

Note. The mean for high anthropomorphism is significantly different from the mean for medium anthropomorphism, according to Tukey-Kramer HSD *post-hoc* test ( $p < .05$ ).

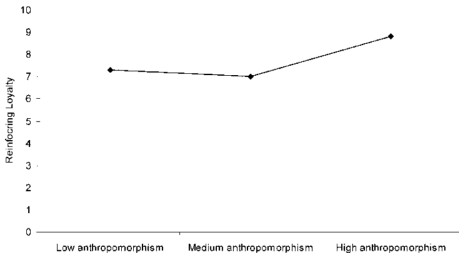
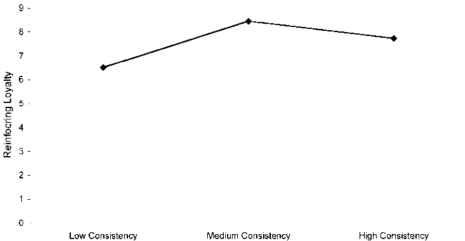


Table 7. Results of one-way ANOVA with consistency index as the IV and reinforcing loyalty measure as the DV

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Low Consistency	36	6.52	3.28	3.93	0.02
Medium Consistency	33	8.45	2.51		
High Consistency	39	7.74	2.82		
Total	108	7.56	2.99		

Note. The mean score of respondents with low consistency is significantly different from the mean score of those with medium consistency, according to Tukey-Kramer HSD *post-hoc* test ( $p < 0.01$ ).



## Methods Critique

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This study adapted to several constraints — the impact of terminal availability on user choice, non-significant findings during multiple regression of indices.

About a fourth of respondents expressed hardcore loyalty in the study's self-report measures of behavioral loyalty. However, it is noted that observational data from study 1 indicates this may be underrepresented.

The study contains a caveat that its conclusions are constrained to an understanding of “hypothetically expressed loyalty”, although the observational measures of study 1 appear to be assessing “performed loyalty” — a possible issue of **construct validity**.

An assumption that terminal selection is an individual decision is inherent throughout this study. An **alternative explanation** for variation in terminal selection involves the social use of labs. Groups of friends or classmates may elect to sit near each other, influencing terminal selection choices for at least one group member. This tendency might be measured via access logs by monitoring clusters of repeated logins to adjacent terminals.

## Discussion

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1. How could the influence of utilization of total computer lab capacity at the time of login be incorporated into a revised analysis of access logs? Would repeat terminal choice in an empty lab lead to different results?
2. What other sources of individual differences (apart from anthropomorphism and consistency) could contribute to loyalty to computers? How would these apply to wearable devices?