Facebook Results Memo

ddd

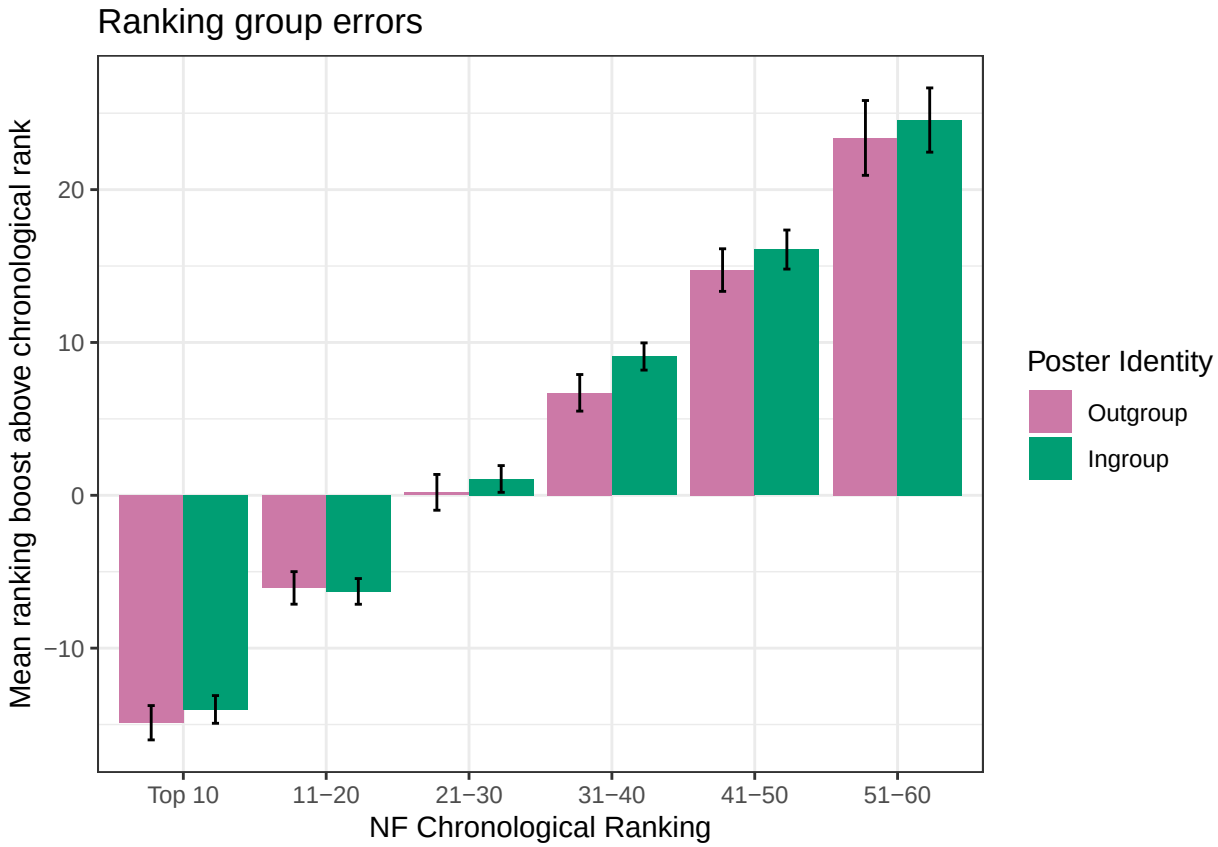
8/27/2020

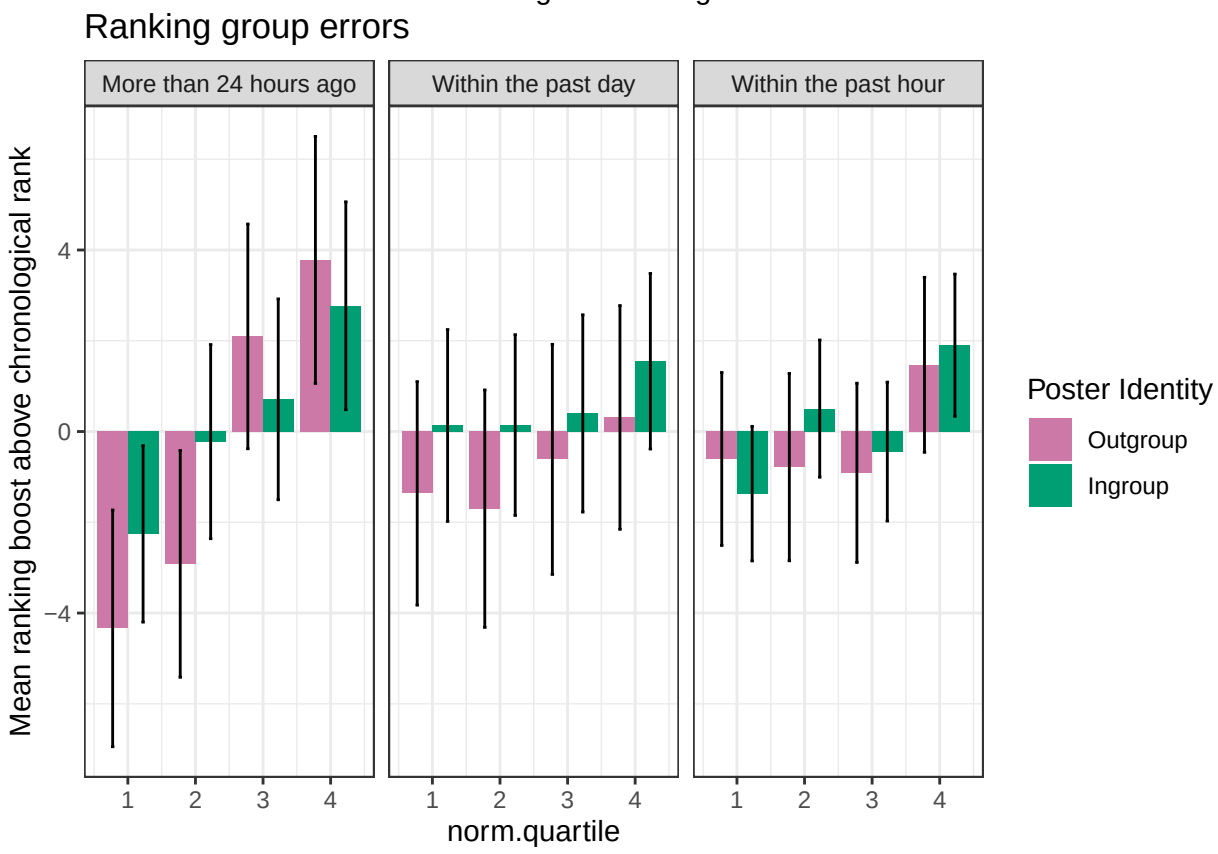
Executive Summary

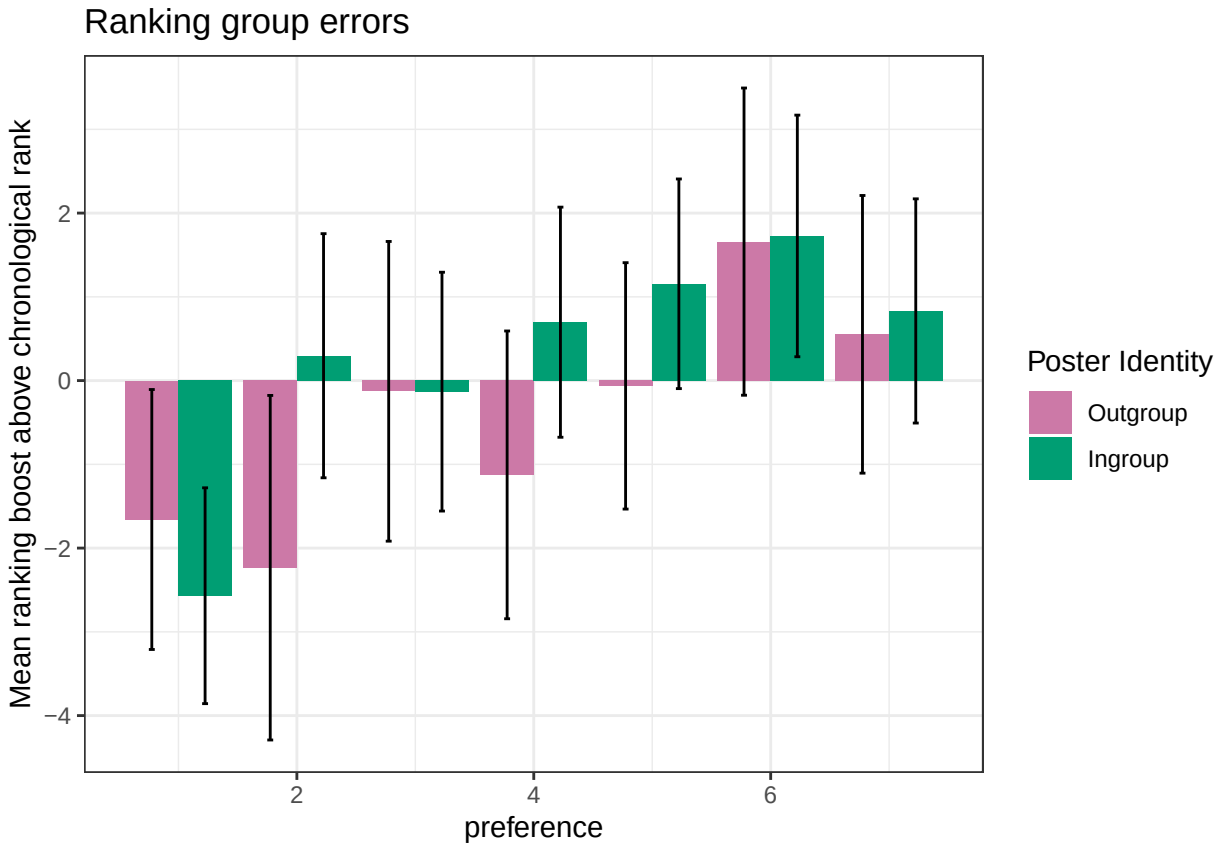
Artificial intelligence has become an important component of how social media platforms try to achieve the goal of bringing people together, by helping prioritize what we see and consume online. These algorithms have the potential to expand people's social networks, but – given evidence of bias with algorithms in other settings – also have the risk of narrowing the breadth of those with whom we interact online, and reinforcing or potentially even exacerbating the high levels of segregation that characterize 'normal' (real-life) interactions. To explore this possibility, we conduct an audit study in which each subject (along with an RA) records their first 60 news feed posts (NF) and the first 60 users recommended by the 'People You May Know' algorithm (PYMK).

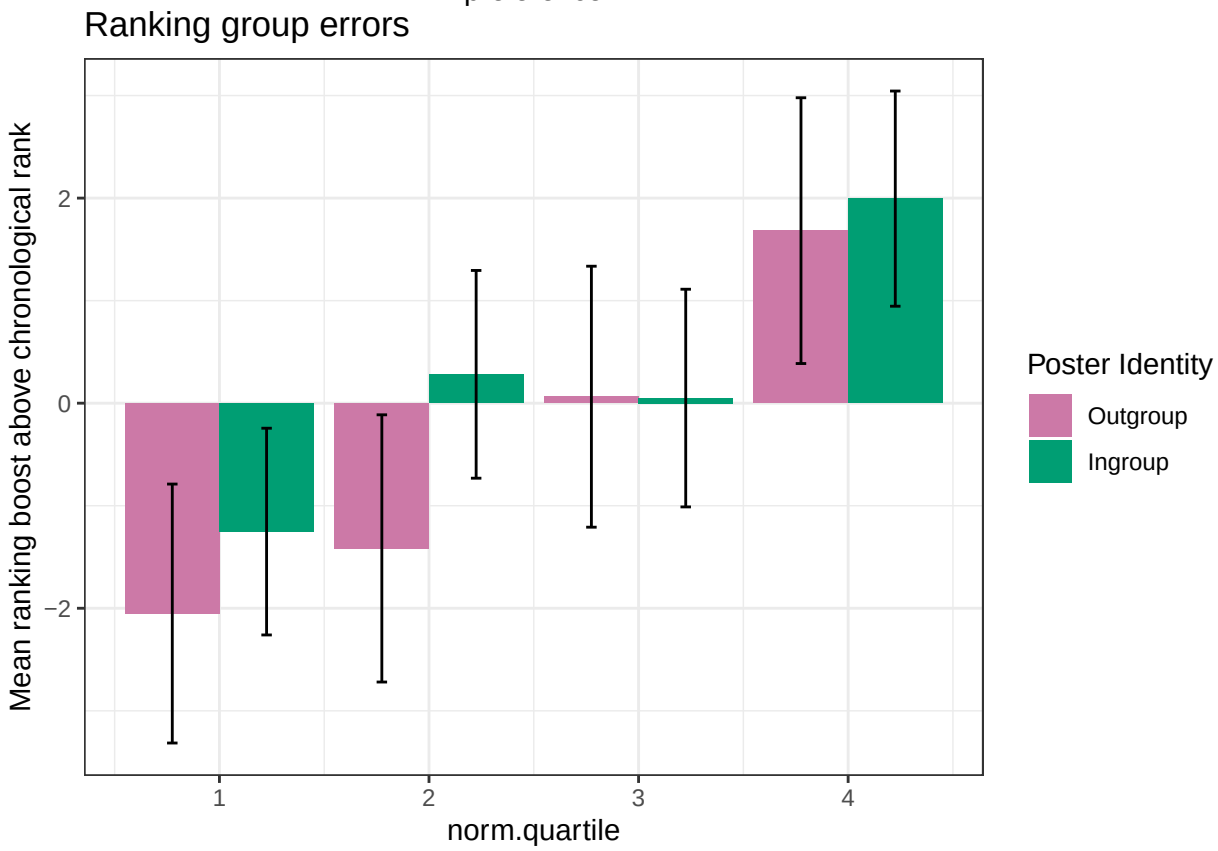
We find evidence of significant discrimination in the NF sorting. When the author and subject are of the same race, the post receives a boost equivalent to 20 percentile points of stated preference; a same-race post in the 50th percentile of stated preference is ranked the same on average as an opposite-race post in the 70th percentile. We find no evidence of discrimination in the PYMK recommendations. We reconcile these findings by distinguishing between behaviors dominated by System 1 (driven by implicit/subconscious attitudes) vs System 2 (driven by explicit/conscious attitudes).

Paper Figures









% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Tue, Feb 02, 2021 - 16:04:31

Table 1:

	Dependent variable:					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	−1.006296***			−1.007704***	−0.931093***	
	(0.339386)			(0.338416)	(0.330125)	
I(100 ∗norm.pctle)		−0.038949***		−0.038960***		−0.040080***
		(0.005737)		(0.005735)		(0.005579)
time_rank			0.232724***		0.232392***	0.233469***
			(0.010967)		(0.010963)	(0.010932)
Constant	23.903490***	25.246370***	17.874620***	25.855030***	18.444260***	19.864020***
	(0.263650)	(0.331596)	(0.302280)	(0.389394)	(0.363434)	(0.409220)
Observations	7,866	7,866	7,866	7,866	7,866	7,866
R^2	0.001117	0.005826	0.054160	0.006946	0.055116	0.060329
Adjusted R^2	0.000990	0.005700	0.054040	0.006693	0.054876	0.060090
Note:						*p<0.1; **p<0

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Table 2:

	Dependent variable:					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	0.380816			0.233062	0.350828	
	(0.351417)			(0.348407)	(0.351504)	
I(100 ∗norm.pctle)		0.080516***		0.080402***		0.082994***
		(0.005686)		(0.005688)		(0.005938)
friend_rank			−0.025632***		−0.025323***	0.014361
			(0.009584)		(0.009589)	(0.009921)
Constant	29.899750***	26.120620***	30.927120***	25.970610***	30.683390***	25.563420***
	(0.287253)	(0.328660)	(0.332993)	(0.397879)	(0.412941)	(0.506150)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R^2	0.000108	0.018099	0.000657	0.018139	0.000749	0.018288
Adjusted R^2	0.000016	0.018008	0.000565	0.017958	0.000565	0.018107
Note:						*p<0.1; **p<0.0

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

% Date and time: Tue, Feb 02, 2021 - 16:04:33

Table 3:

	Dependent variable:					
	new.rank					
	(1)	(2)	(3)	(4)	(5)	(6)
religion.in.group	0.380816			0.233062	0.340765	
	(0.351417)			(0.348407)	(0.351381)	
I(100 ∗norm.pctle)		0.080516***		0.080402***		0.081097***
		(0.005686)		(0.005688)		(0.005937)
pct_friend_rank			−0.035643***		−0.035356***	0.003374
			(0.009581)		(0.009586)	(0.009920)
Constant	29.899750***	26.120620***	31.228980***	25.970610***	30.992630***	25.989760***
	(0.287253)	(0.328660)	(0.332891)	(0.397879)	(0.412569)	(0.506051)
Observations	10,882	10,882	10,882	10,882	10,882	10,882
R^2	0.000108	0.018099	0.001270	0.018139	0.001357	0.018109
Adjusted R^2	0.000016	0.018008	0.001179	0.017958	0.001173	0.017929
Note:						∗p<0.1; ∗∗p<0.05

control correlations

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:04:35

Table 4: Correlations 1

	Pearson	Spearman	Kendall
NF Rank, Time	0.233	0.238	0.165
PYMK Rank, Pct Friends	-0.036	-0.035	-0.024

Correlation matrix for benchmarks

preference correlations

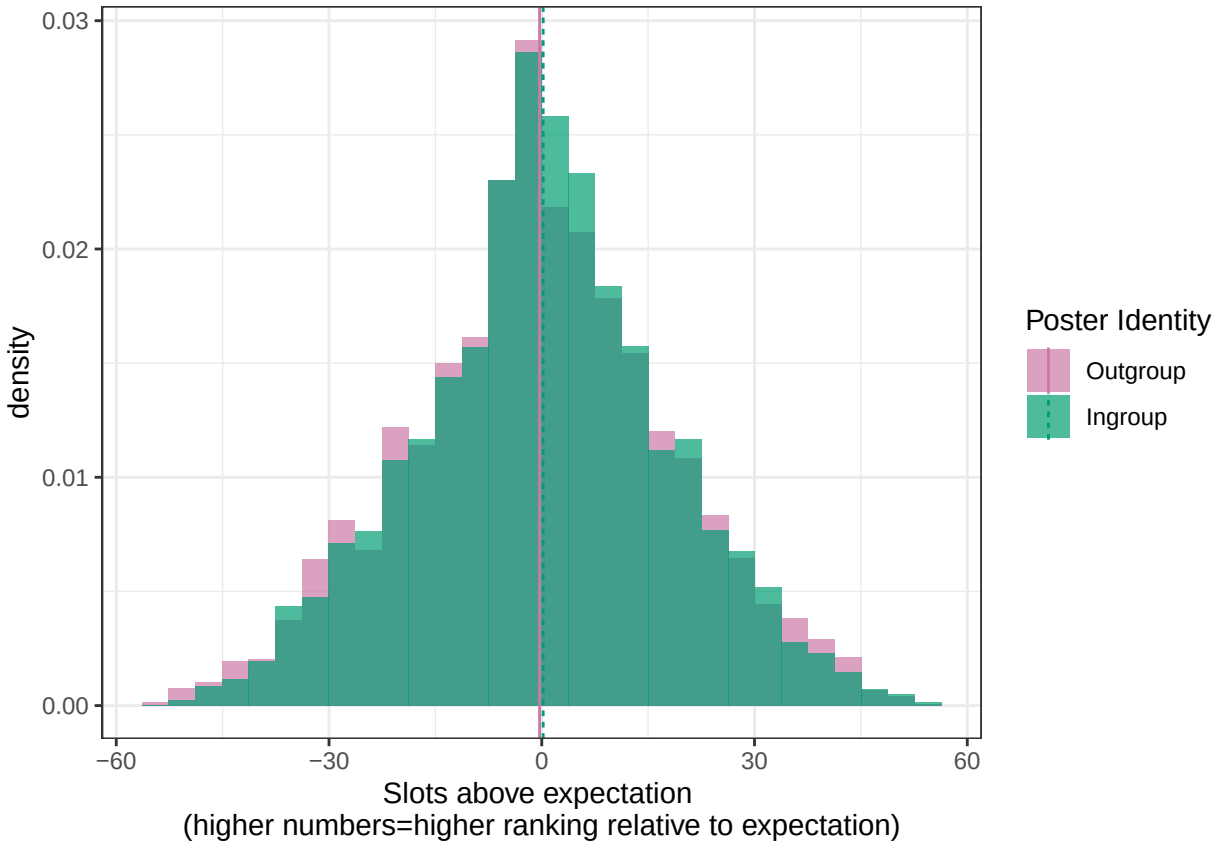
% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:04:37

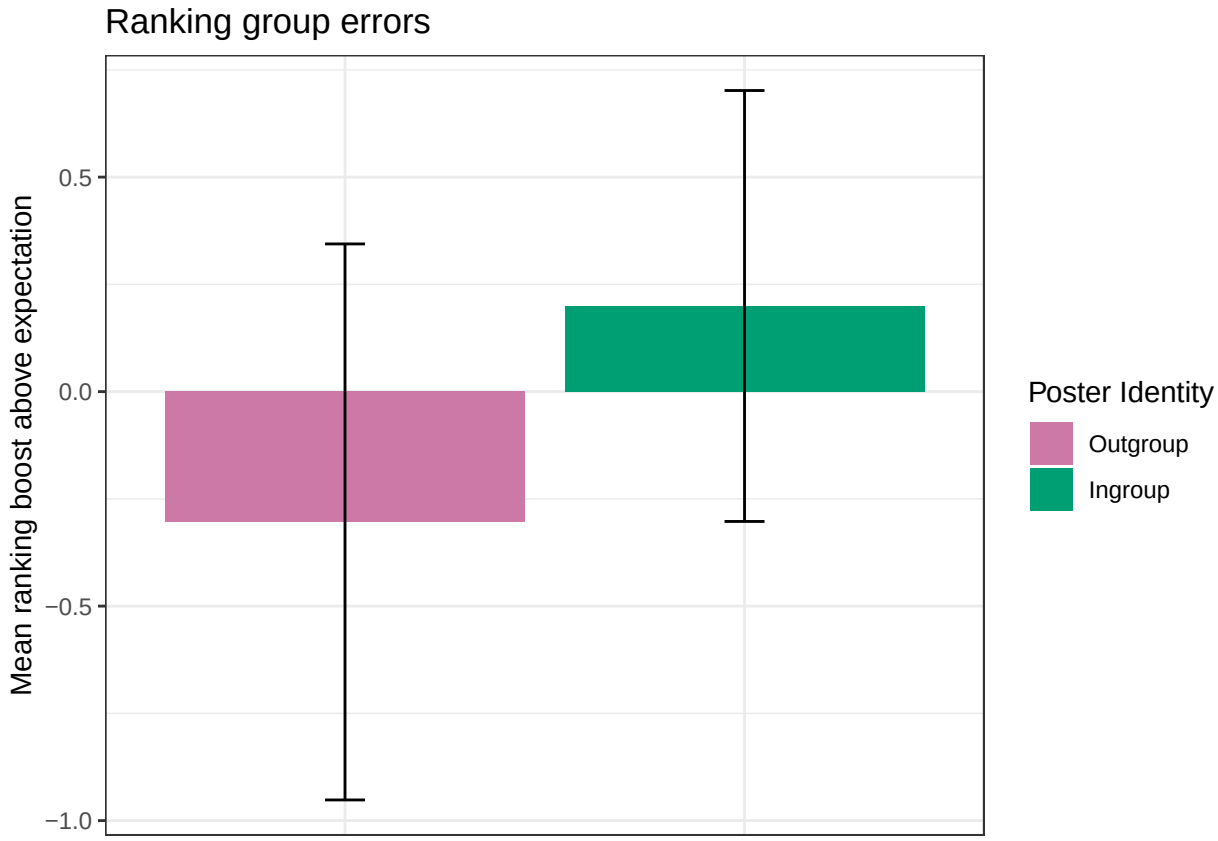
Table 5: Correlations 2

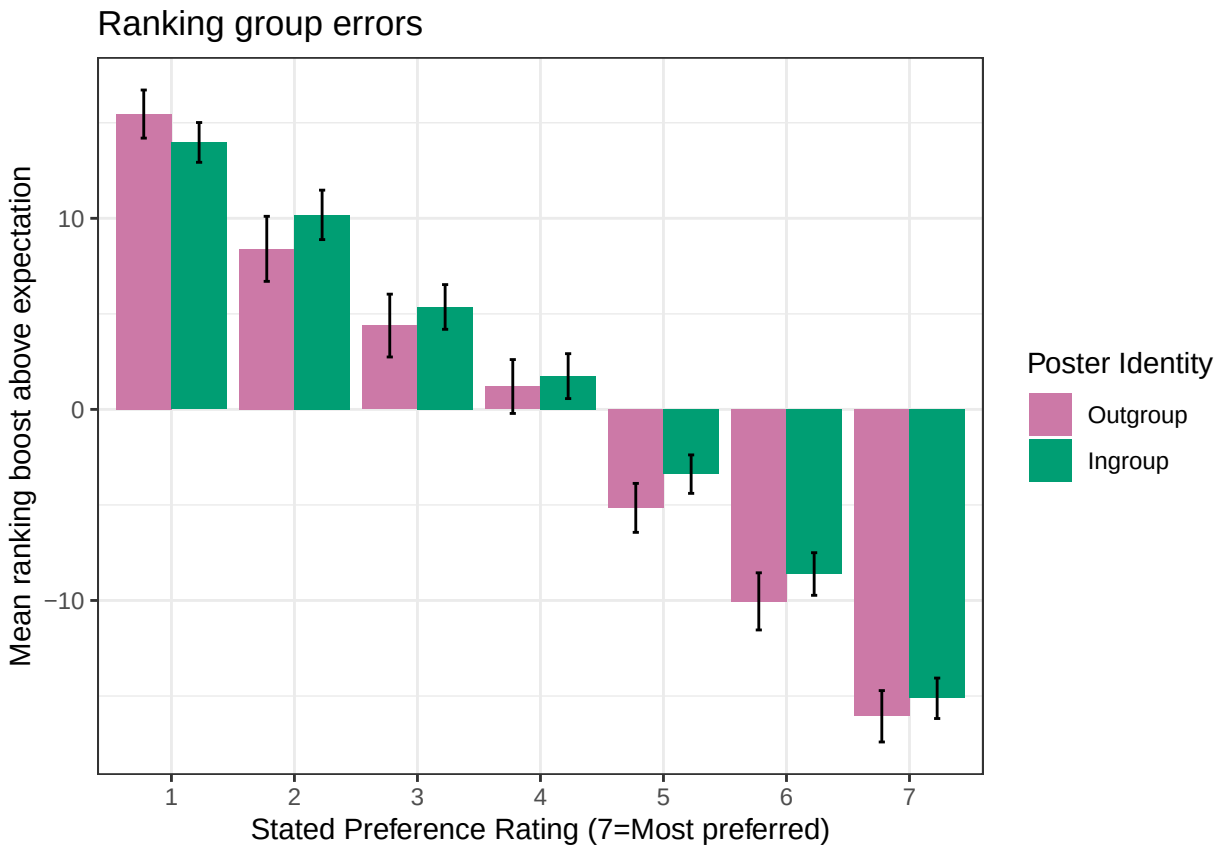
	Pearson	Spearman	Kendall
NF Rank, Preference	-0.078	-0.079	-0.053
PYMK Rank, Familiarity	0.140	0.134	0.091

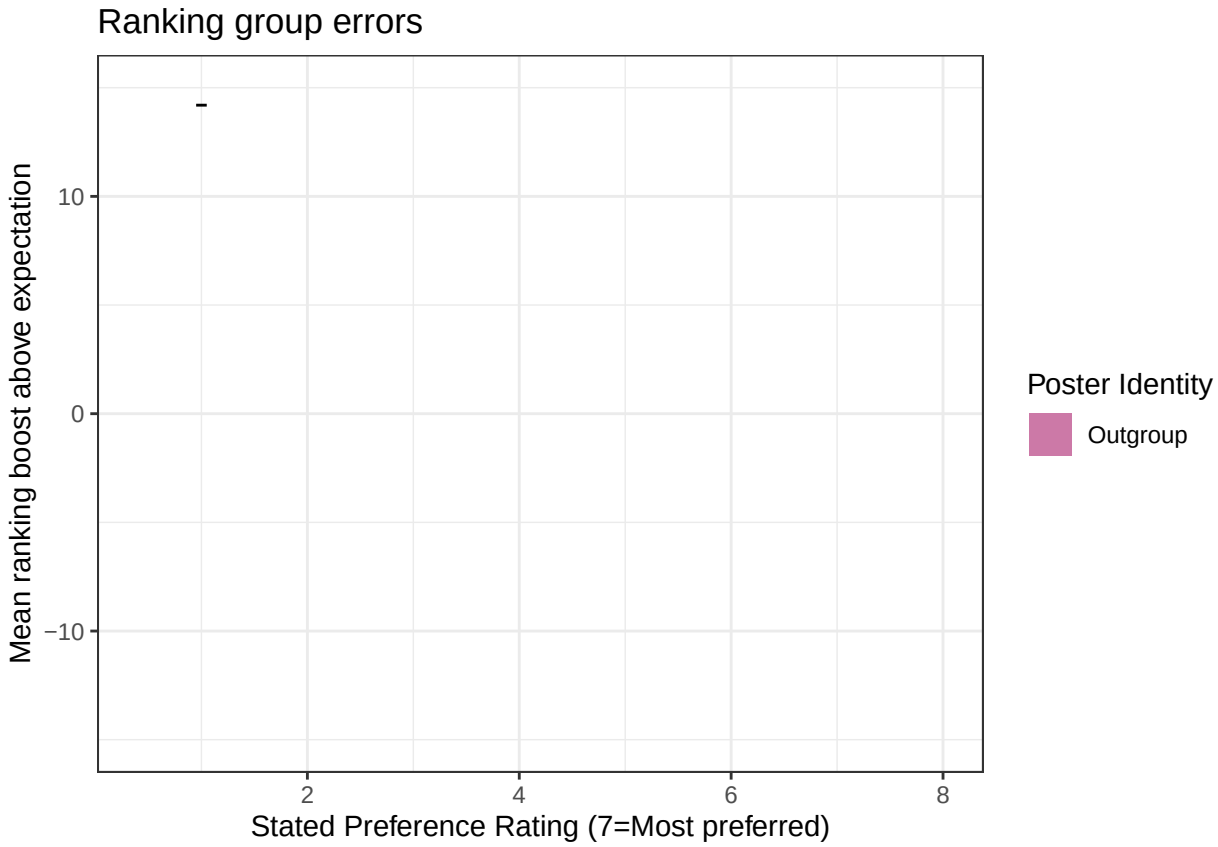
Correlation matrix for preferences

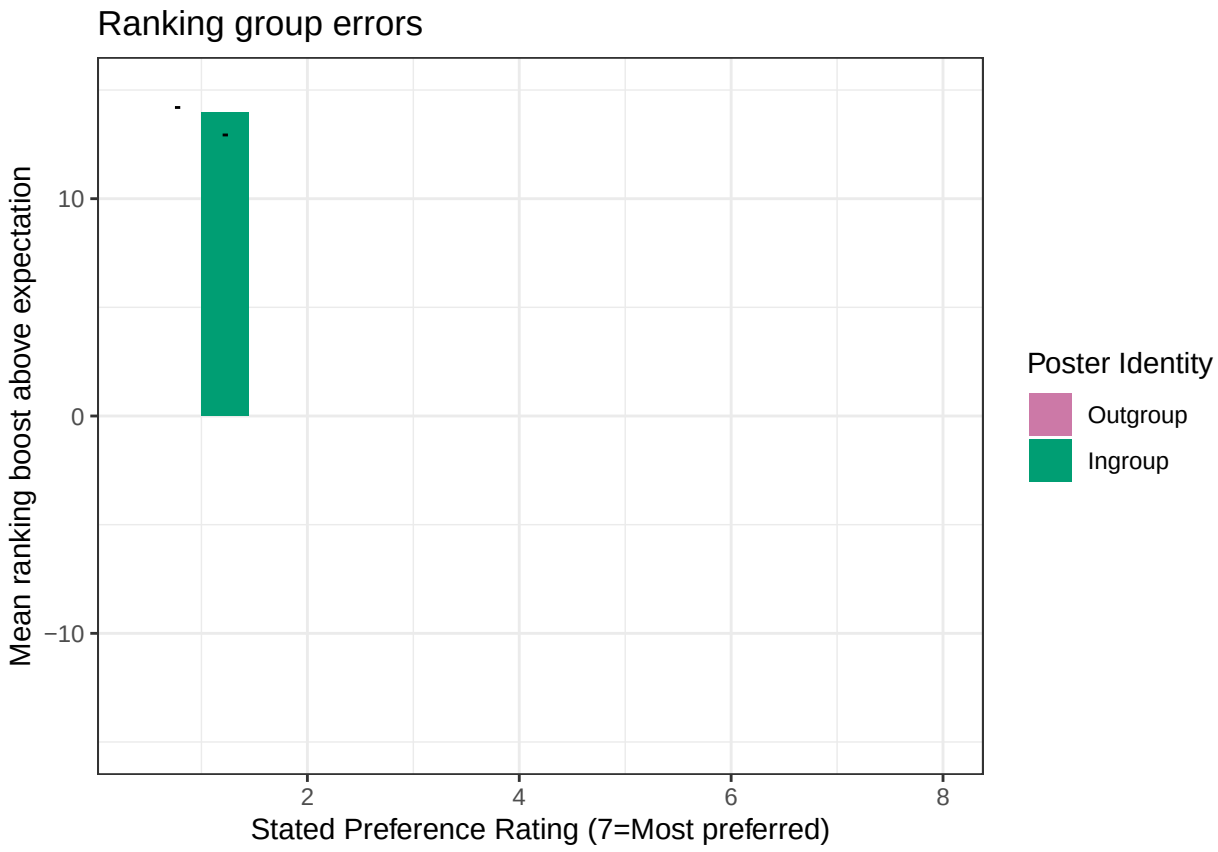

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

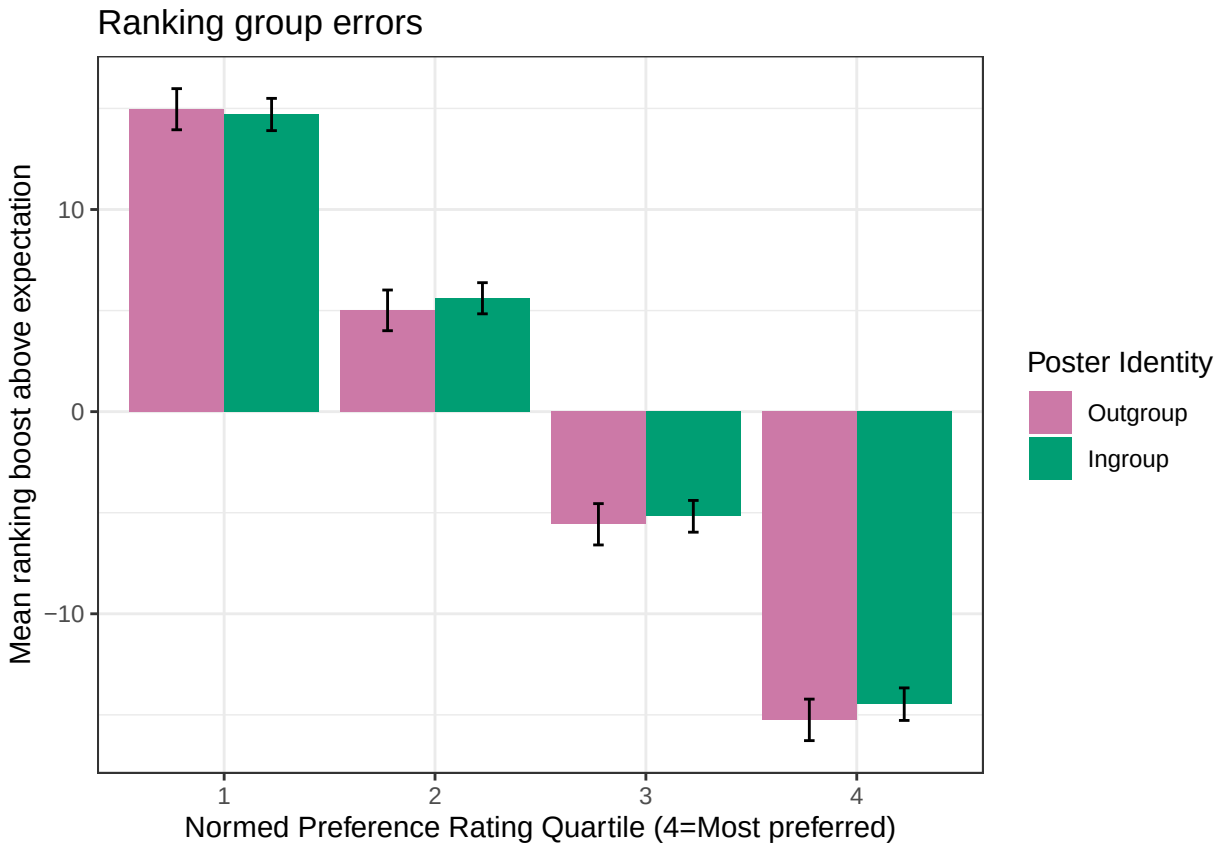

0.03
0.02
0.01
0.00
density
−60
−30
0
30
60
Slots above expectation
(higher numbers=higher ranking relative to expectation)
Poster Identity
Outgroup
Ingroup

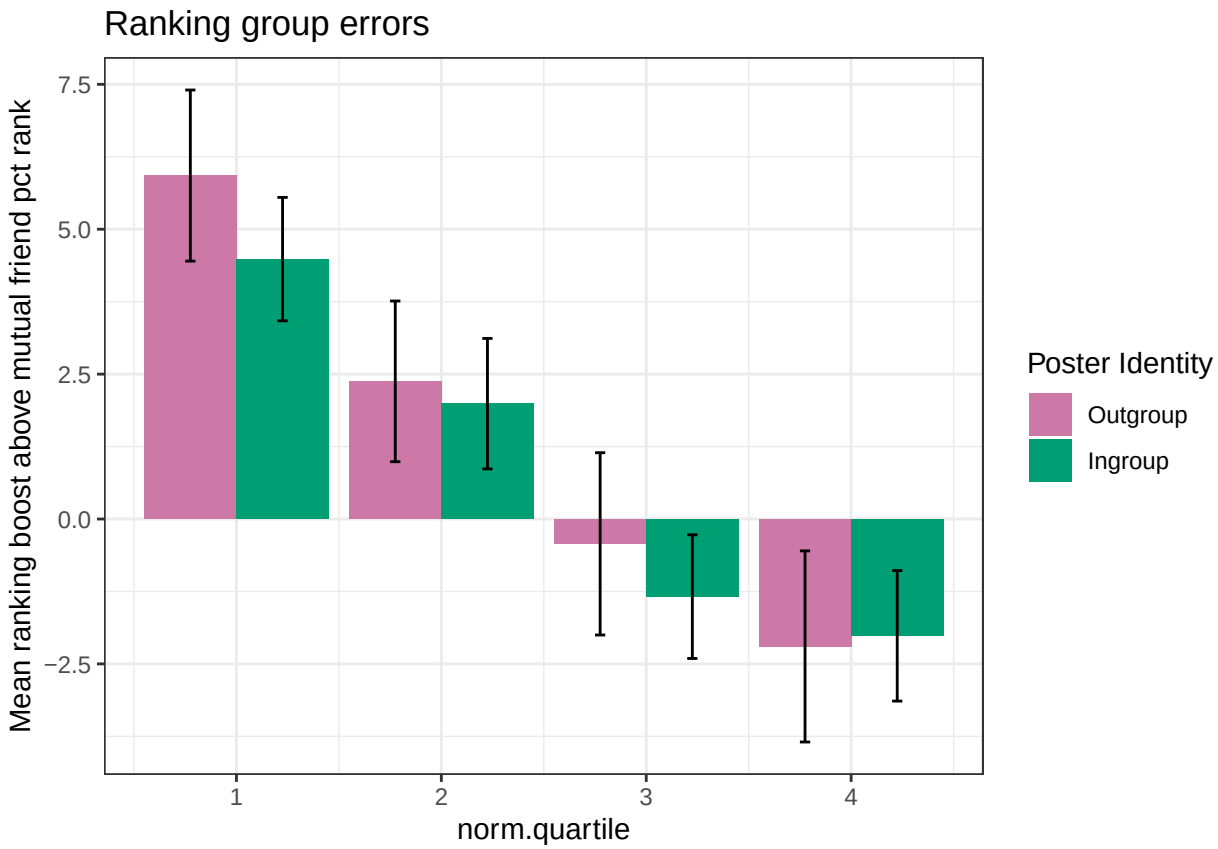

Ranking group errors
0.5
0.0
−0.5
−1.0
Mean ranking boost above expectation
Poster Identity
Outgroup
Ingroup


Ranking group errors
Mean ranking boost above expectation
10
0
−10
1
2
3
4
5
6
7
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

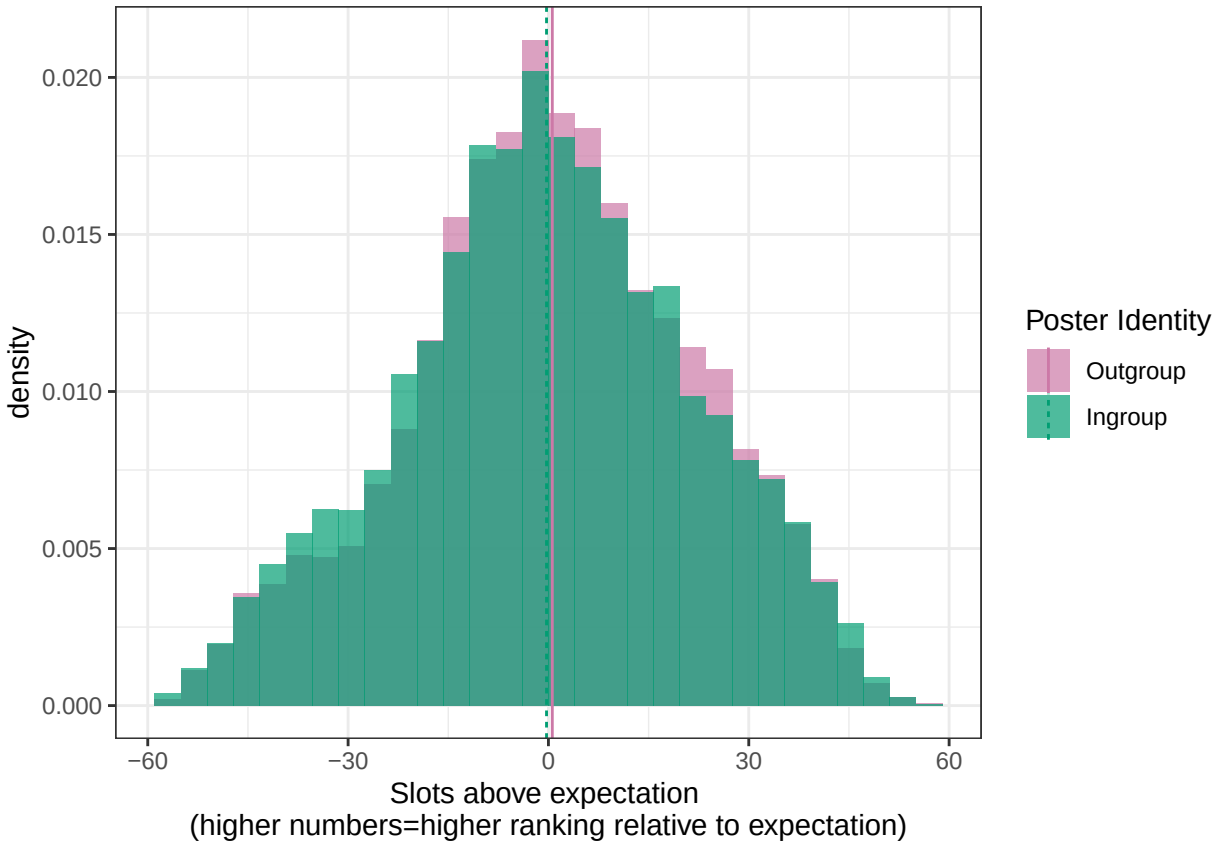

Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup


Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

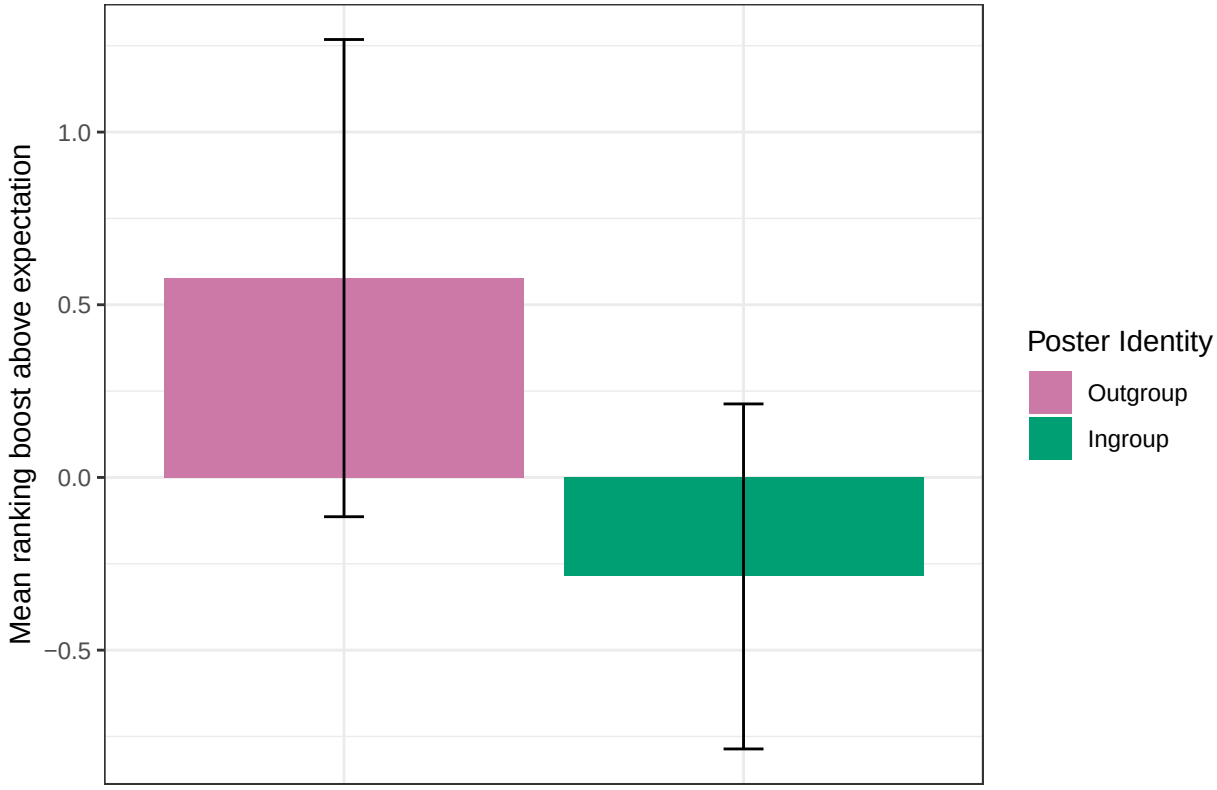

Ranking group errors
Mean ranking boost above expectation
10
0
−10
1
2
3
4
Normed Preference Rating Quartile (4=Most preferred)
Poster Identity
Outgroup
Ingroup

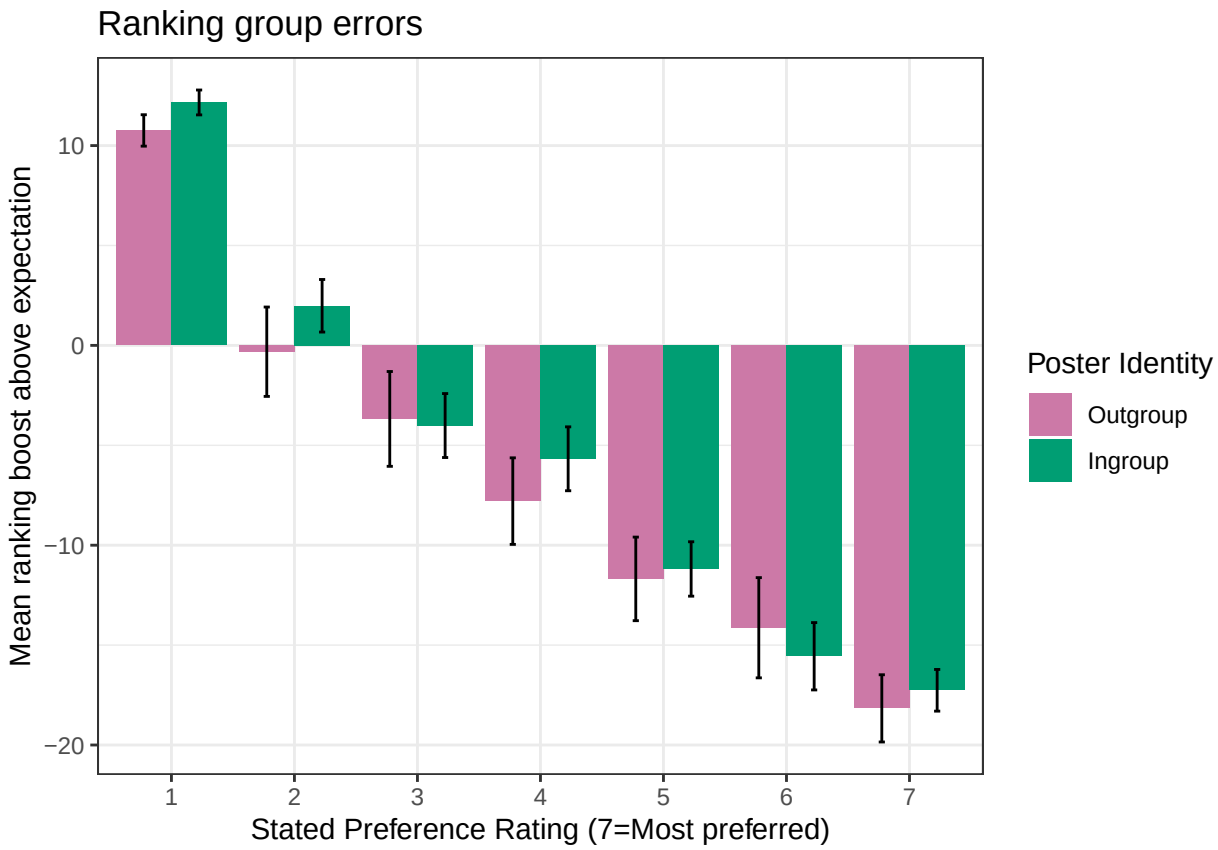


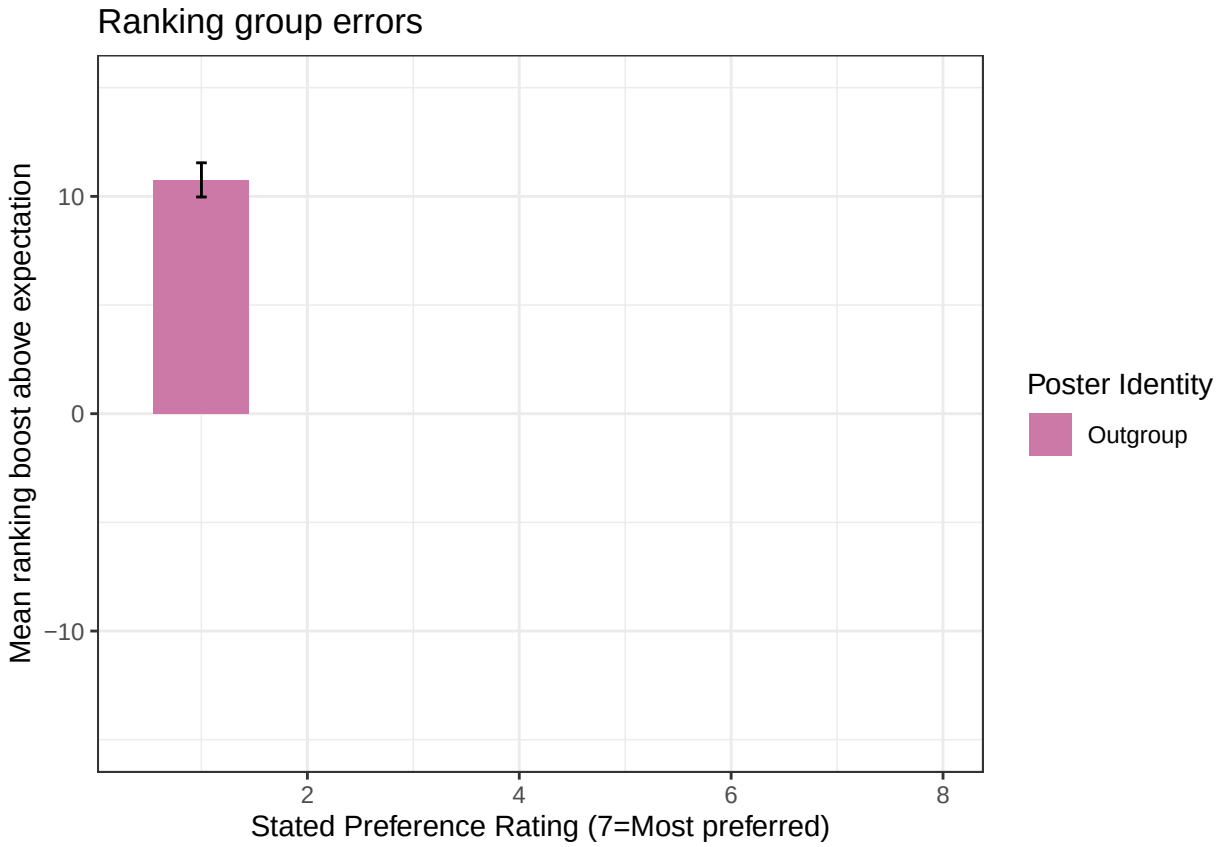

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

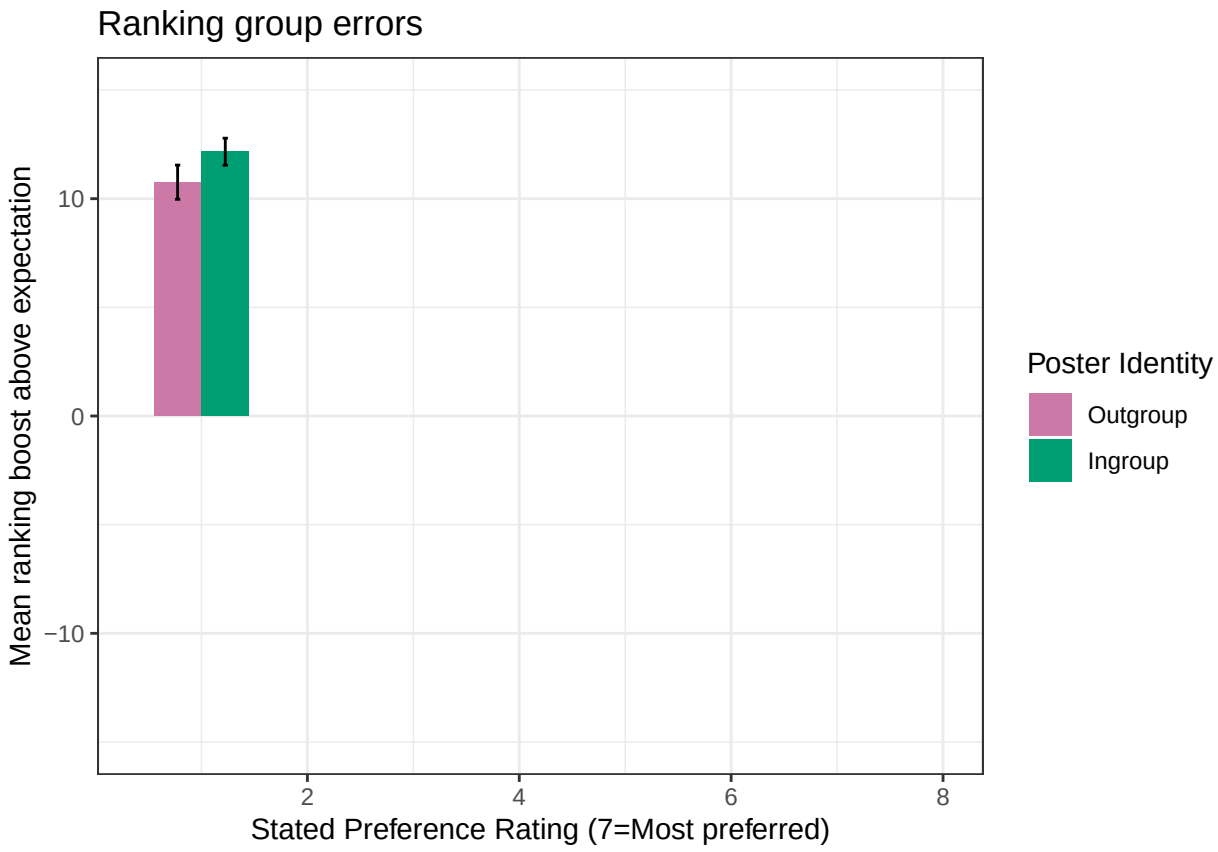


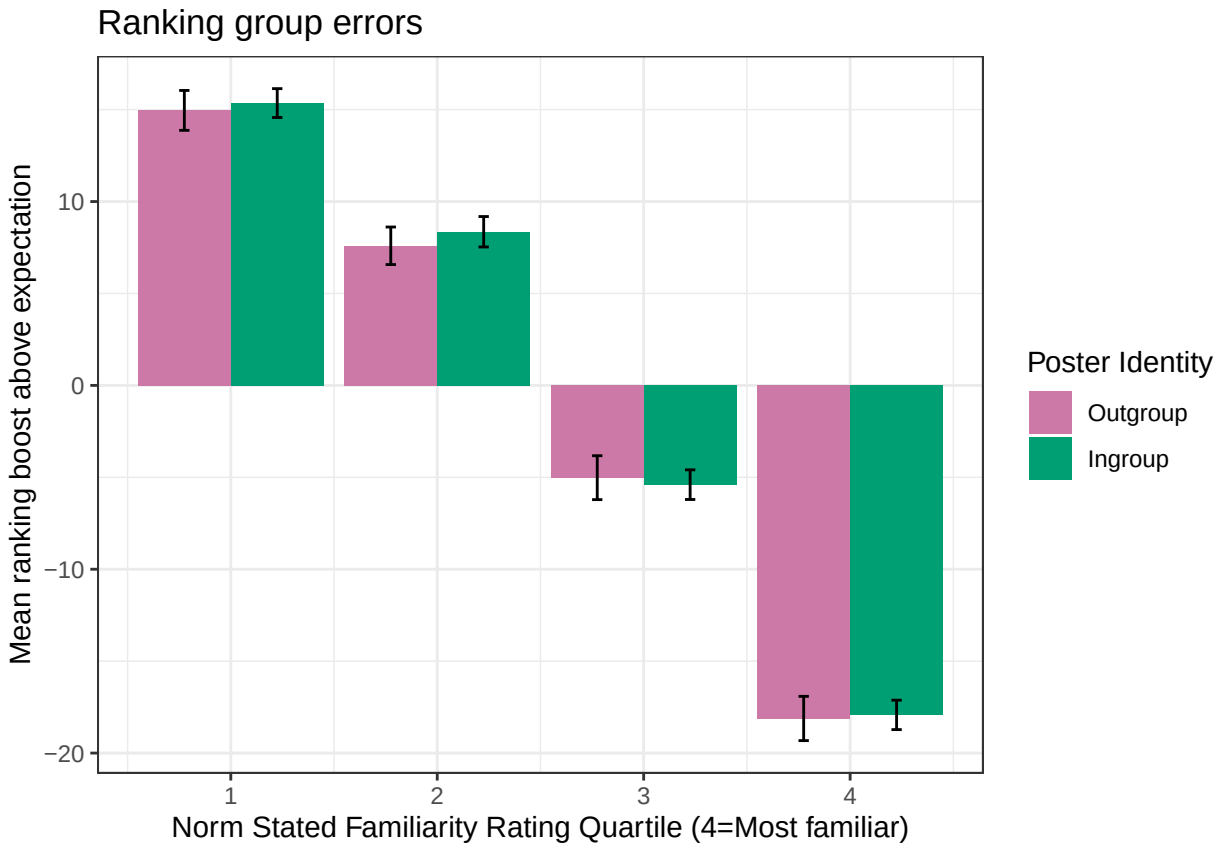
Ranking group errors



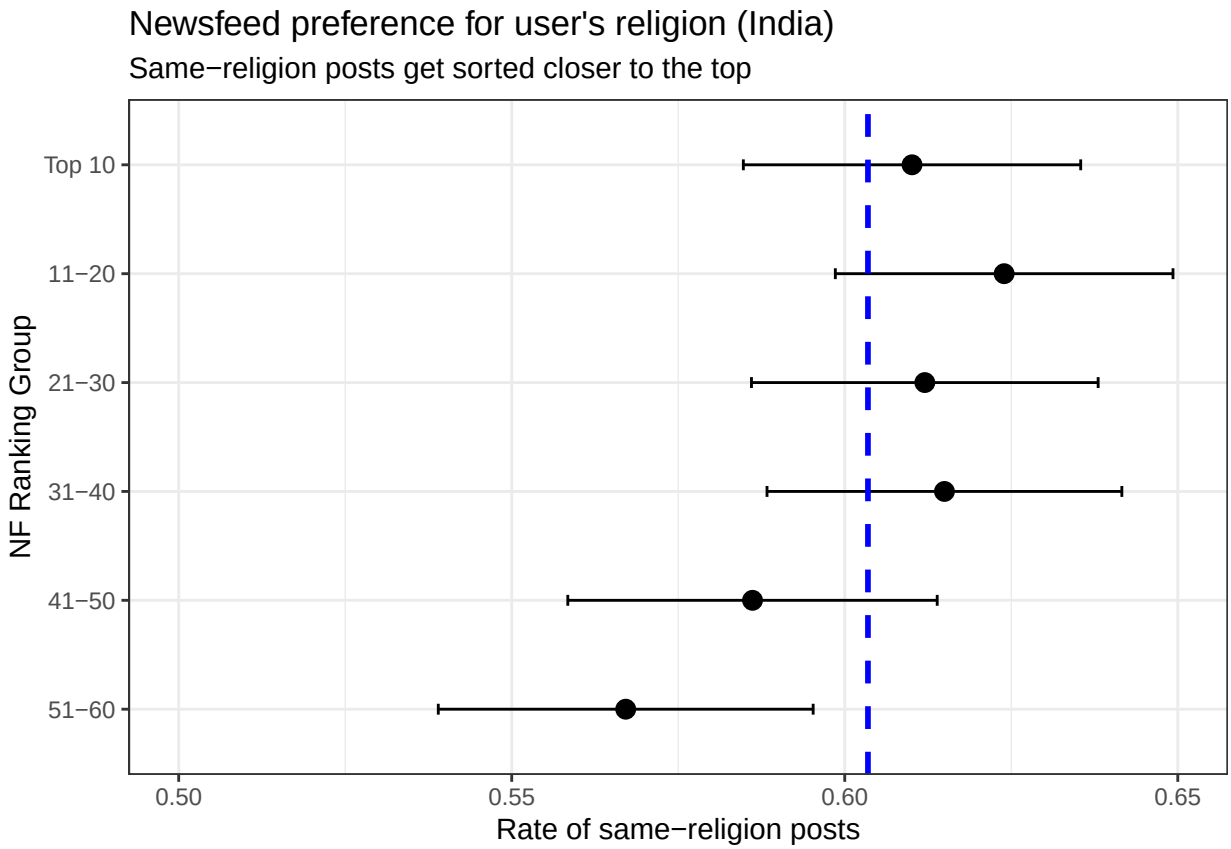

Ranking group errors
Mean ranking boost above expectation
10
0
−10
−20
1
2
3
4
5
6
7
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

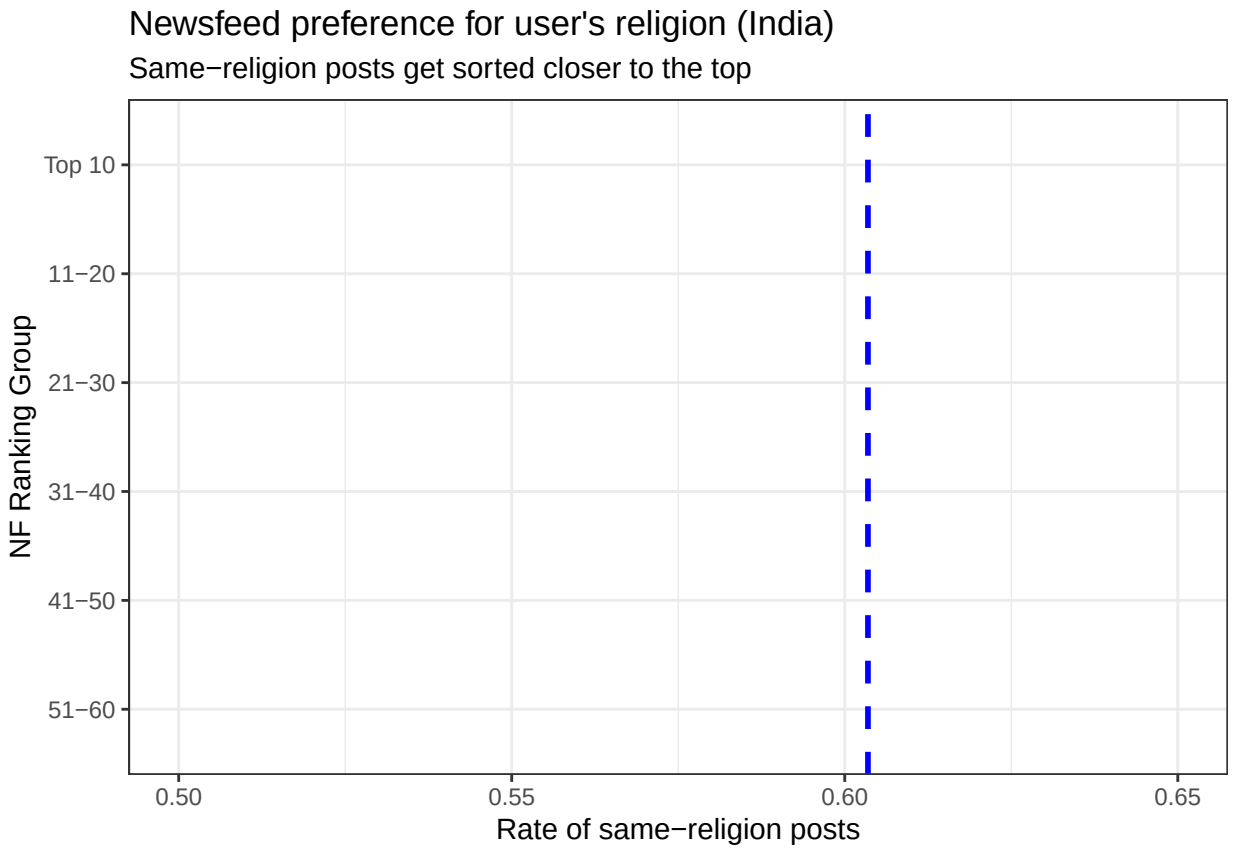

Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup


Ranking group errors
Mean ranking boost above expectation
10
0
−10
2
4
6
8
Stated Preference Rating (7=Most preferred)
Poster Identity
Outgroup
Ingroup

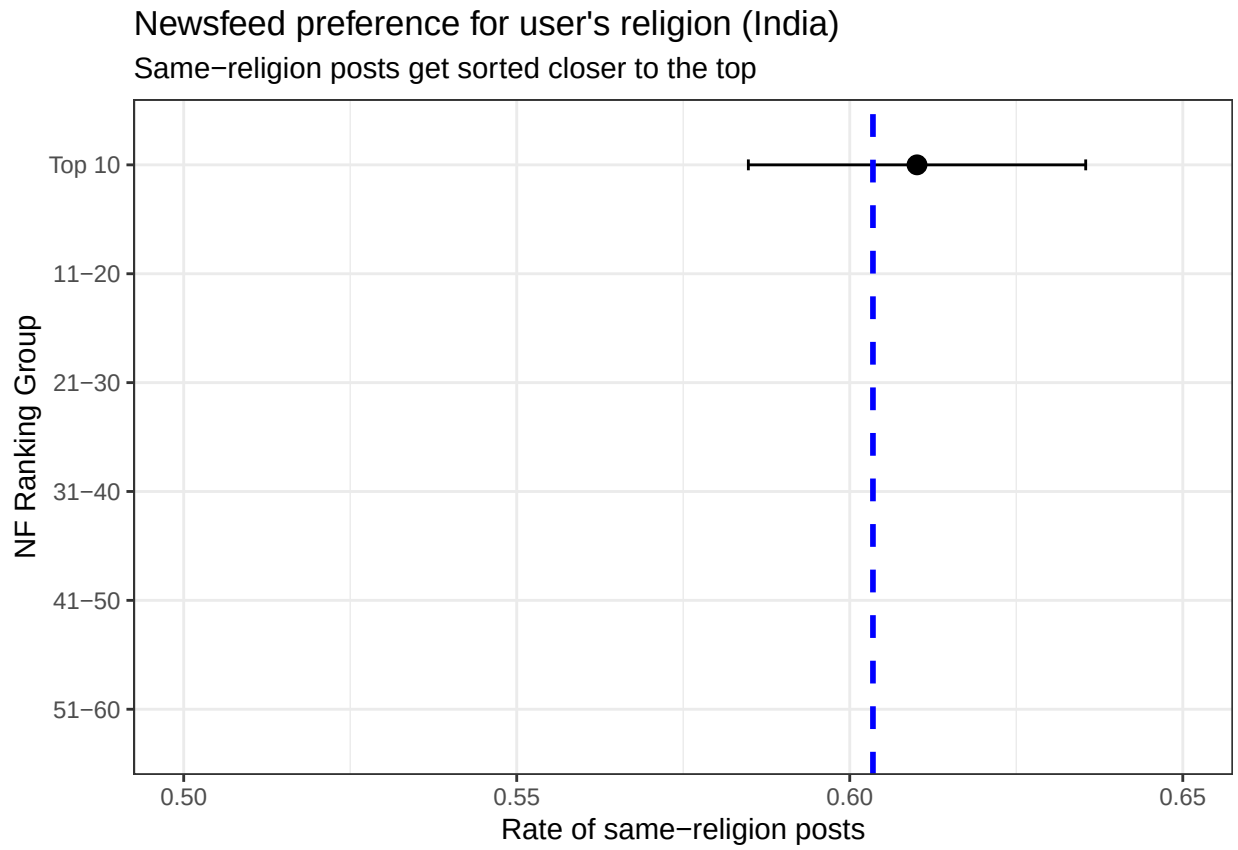

Ranking group errors
Mean ranking boost above expectation
10
0
−10
−20
1
2
3
4
Norm Stated Familiarity Rating Quartile (4=Most familiar)
Poster Identity
Outgroup
Ingroup

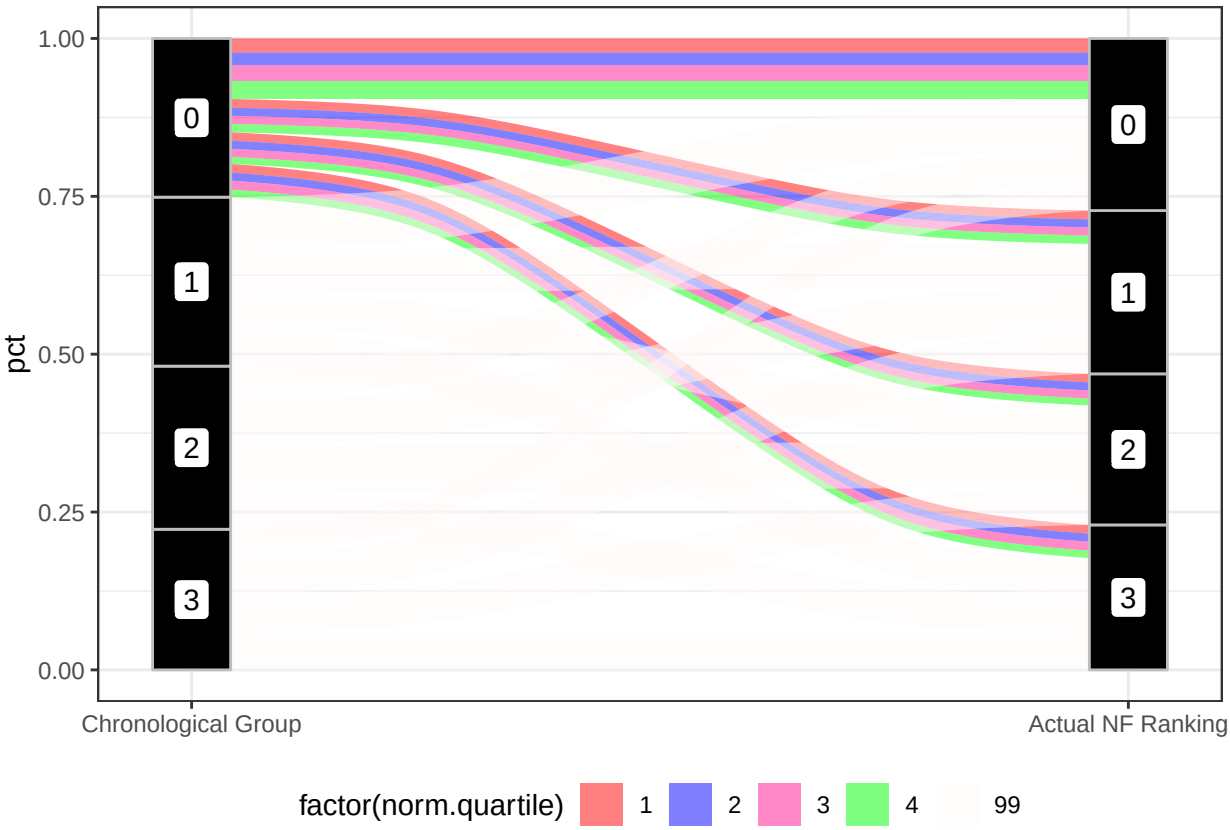
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

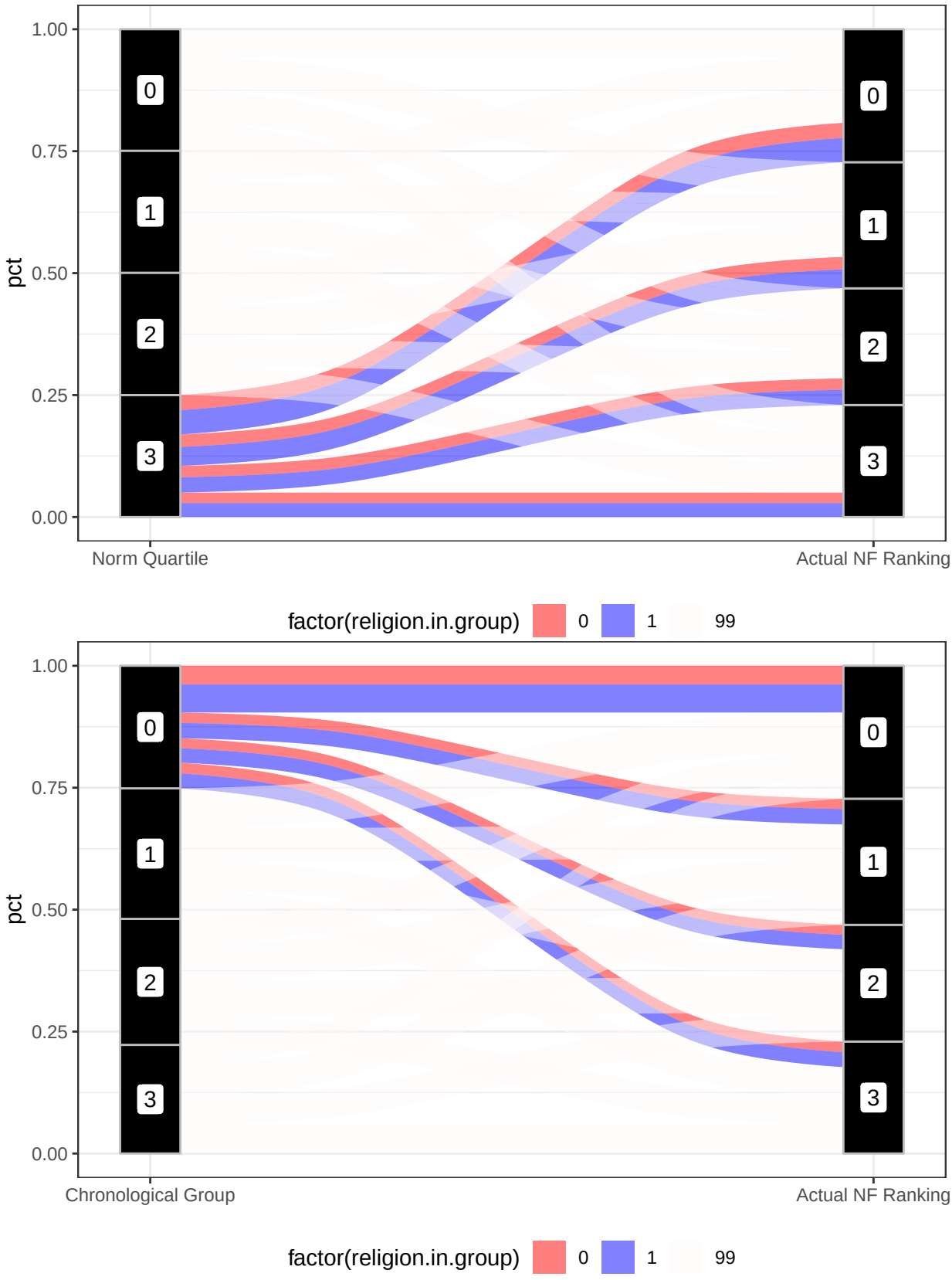


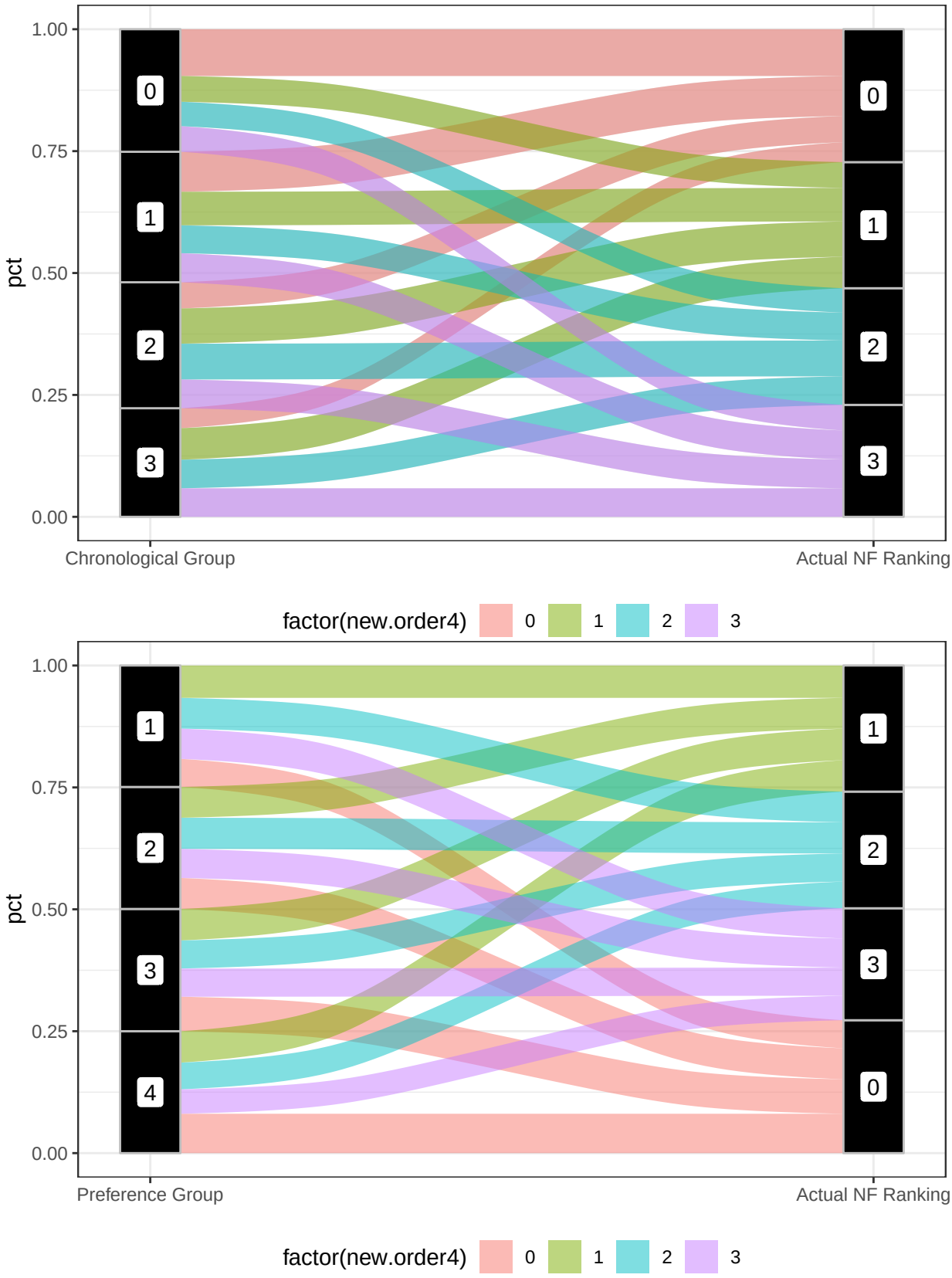


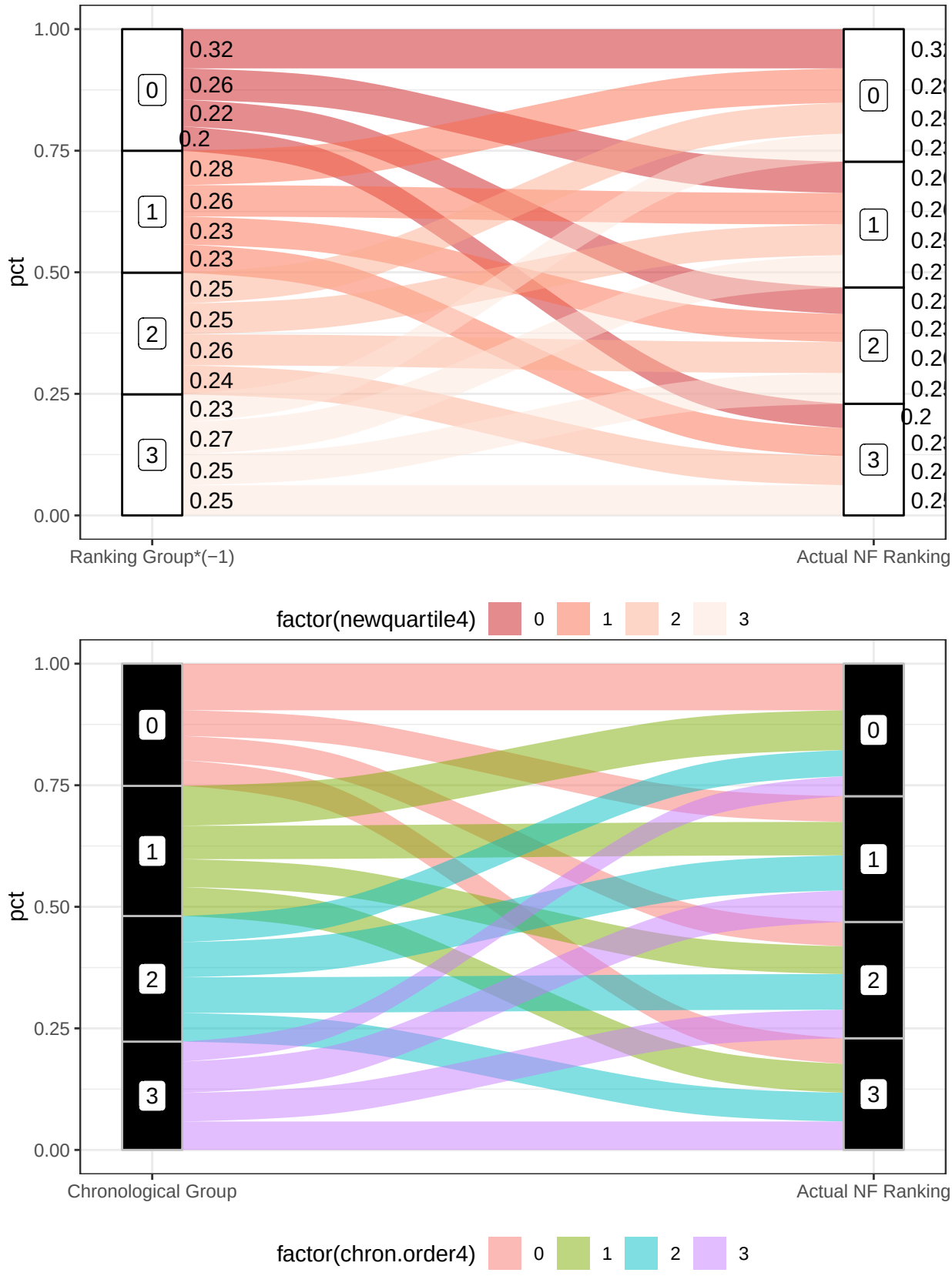

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

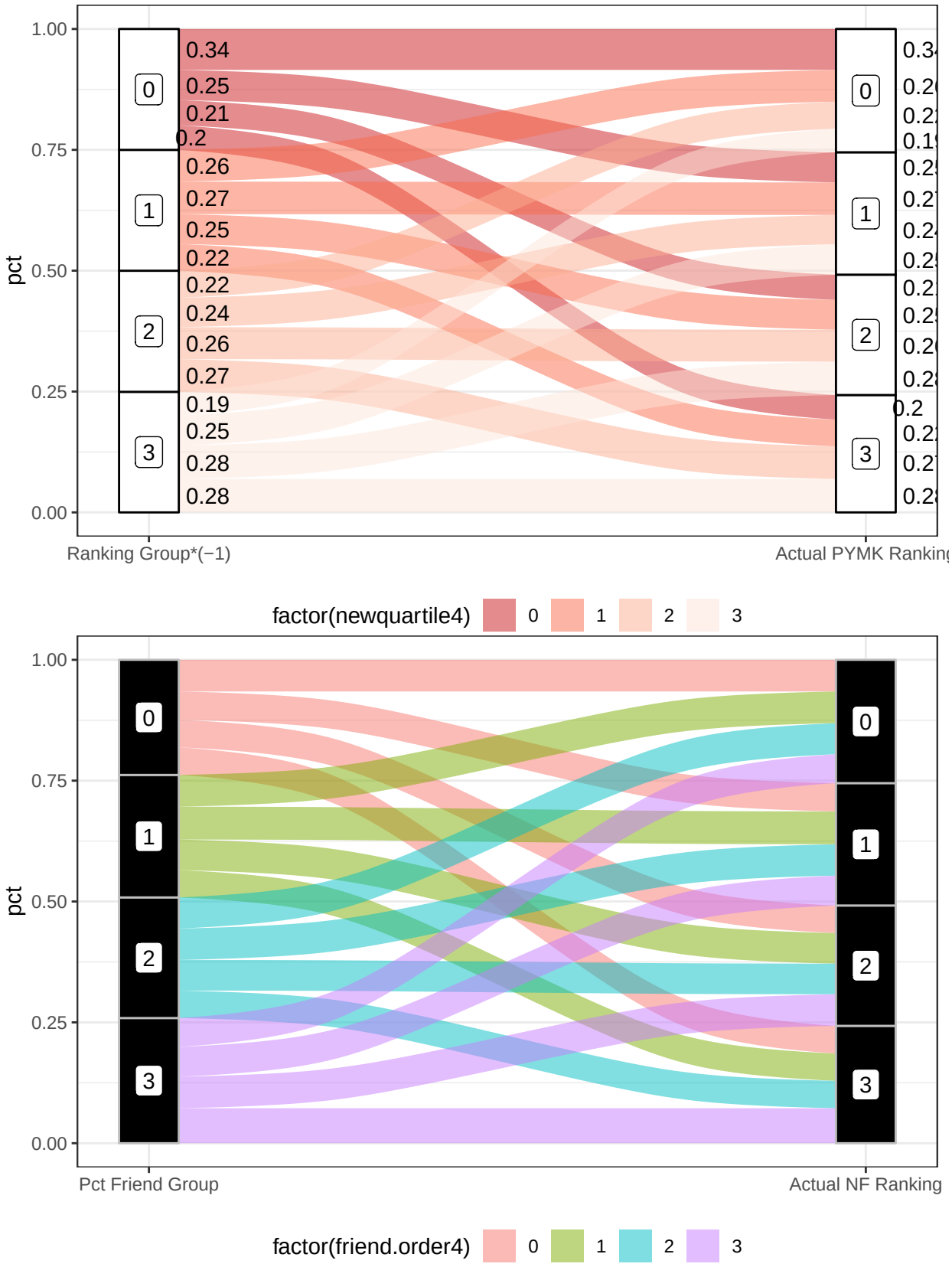

Newsfeed preference for user's religion (India)
Same−religion posts get sorted closer to the top
NF Ranking Group
Top 10
11−20
21−30
31−40
41−50
51−60
0.50
0.55
0.60
0.65
Rate of same−religion posts

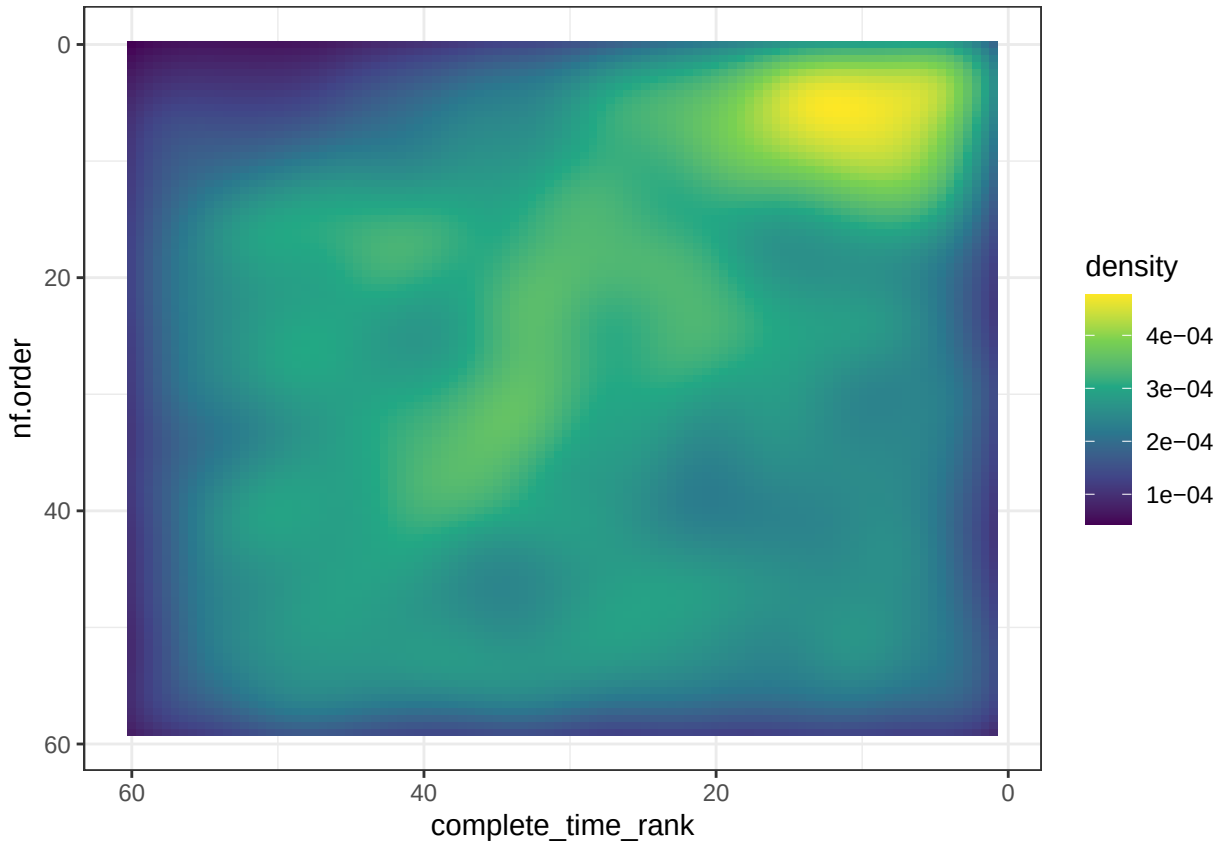

pct
1.00
0.75
0.50
0.25
0.00
0
1
2
3
Chronological Group
Actual NF Ranking
factor(norm.quartile)
1
2
3
4
99

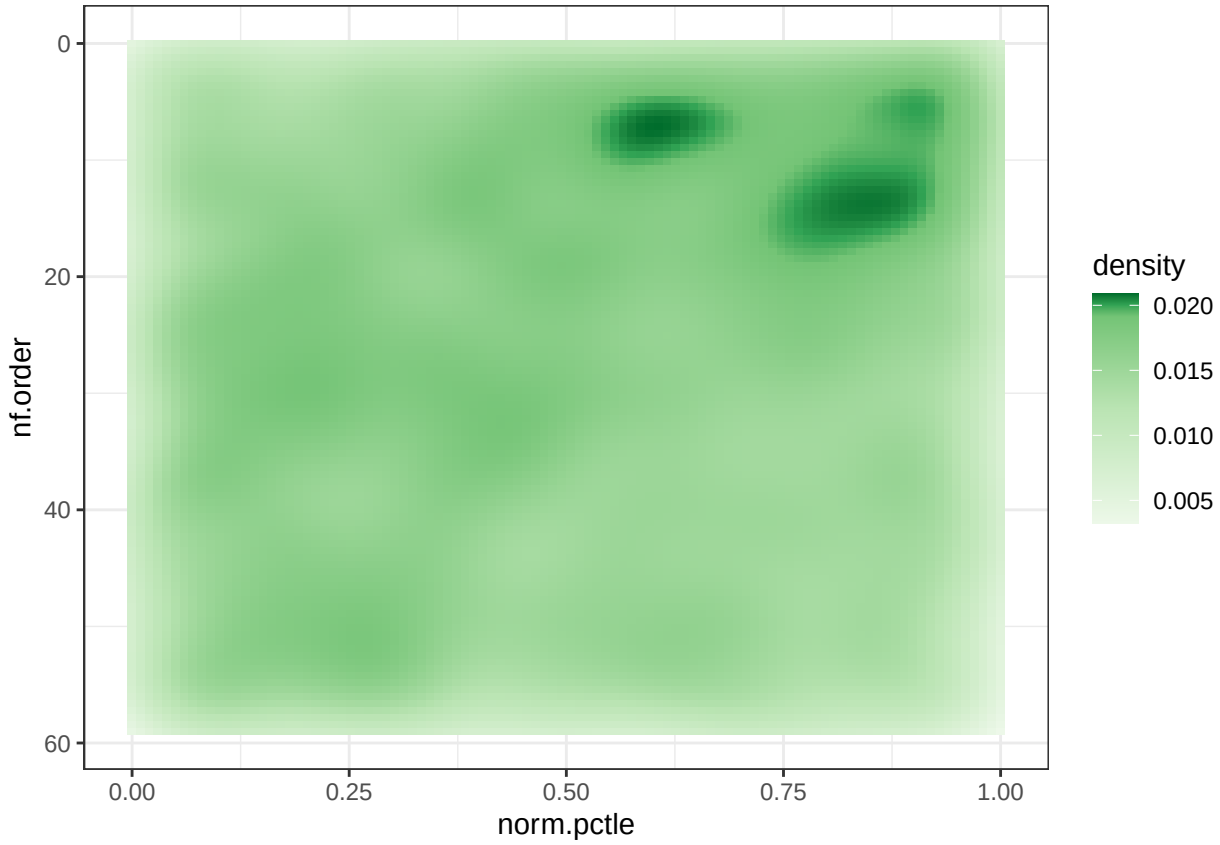

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
Norm Quartile
Actual NF Ranking
factor(religion.in.group)
0
1
99
Chronological Group

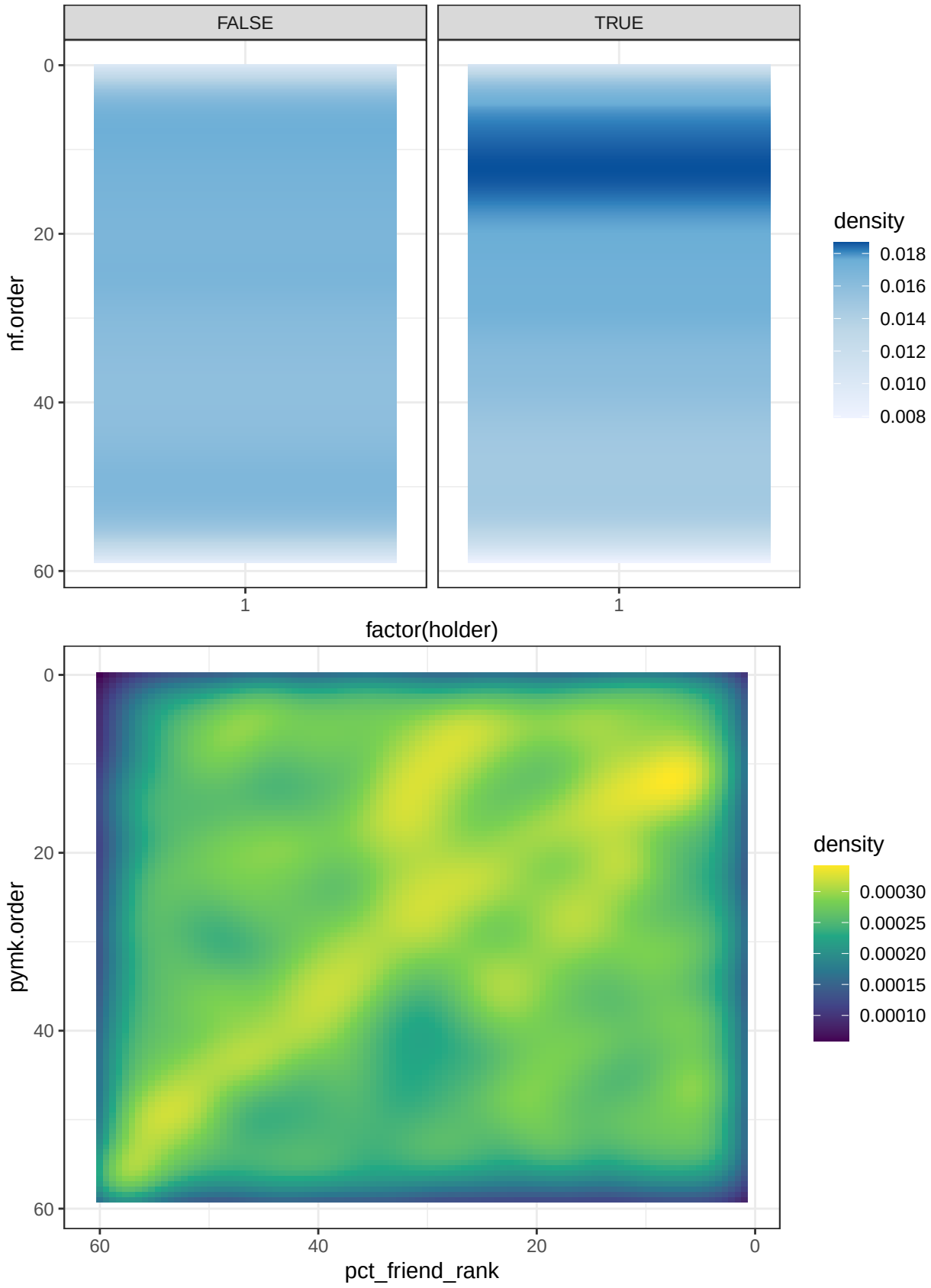

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
Chronological Group
Actual NF Ranking
factor(new.order4)
0
1
2
3
1.00
0.75
0.50
0.25
0.00
pct
1
2
3
4
Preference Group
Actual NF Ranking
0
1
2
3
factor(new.order4)
0
1
2
3

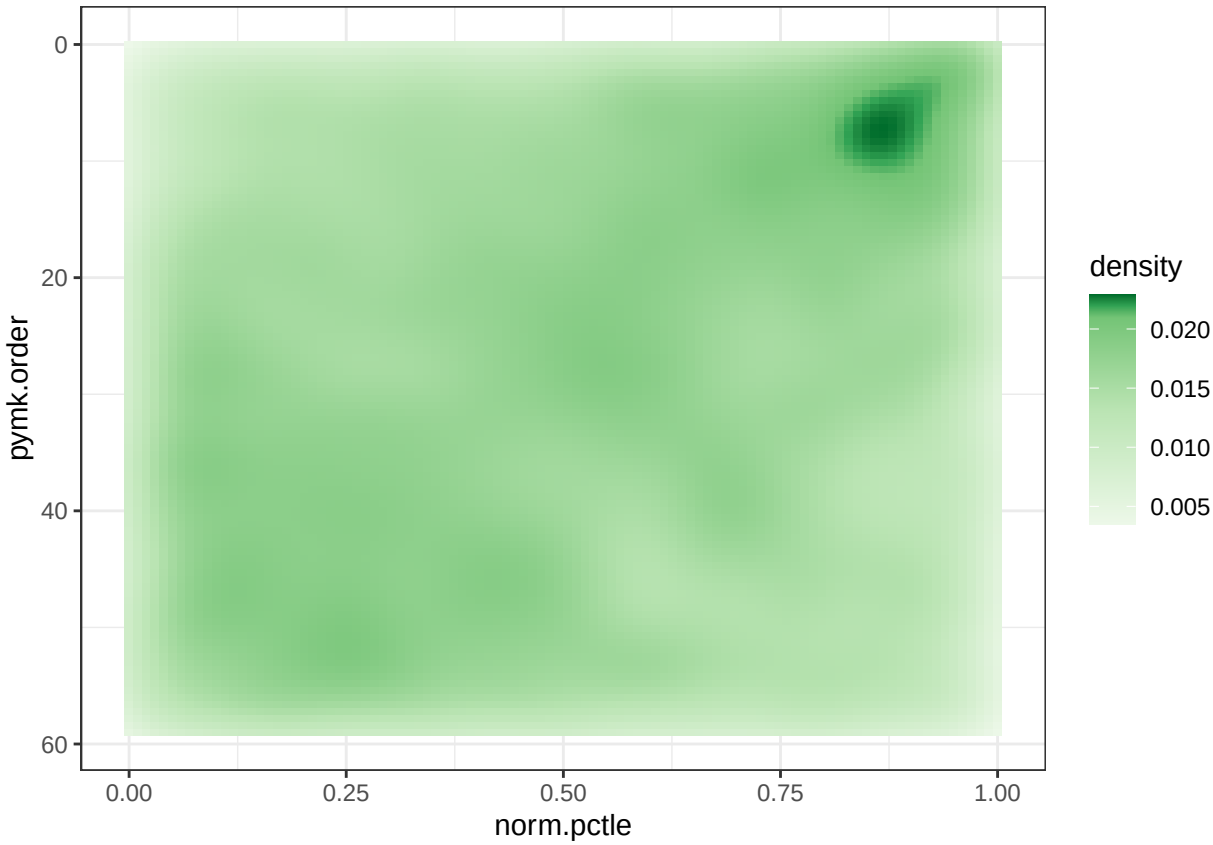

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
0.32
0.26
0.22
0.2
0.28
0.26
0.23
0.23
0.25
0.25
0.26
0.24
0.23
0.27
0.25
0.25
Ranking Group*(−1)
Actual NF Ranking
factor(newquartile4)
0
1
2
3
Chronological Group
factor(chron.order4)

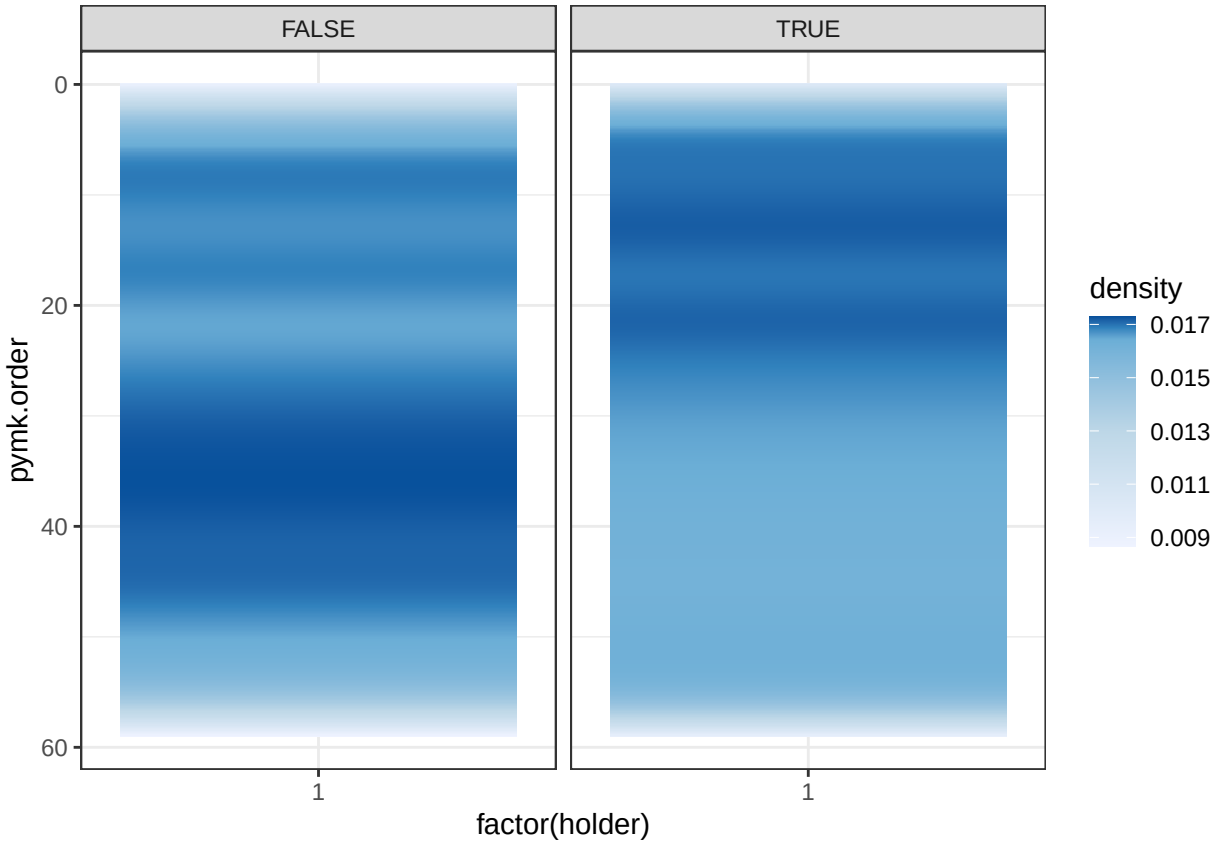

1.00
0.75
0.50
0.25
0.00
pct
0
1
2
3
0.34
0.25
0.21
0.2
0.26
0.27
0.25
0.22
0.22
0.24
0.26
0.27
0.19
0.25
0.28
0.28
Ranking Group*(−1)
Actual PYMK Ranking
factor(newquartile4)
0
1
2
3
1.00
0.75
0.50
0.25
0.00
pct
Pct Friend Group
Actual NF Ranking
factor(friend.order4)
0
1
2
3

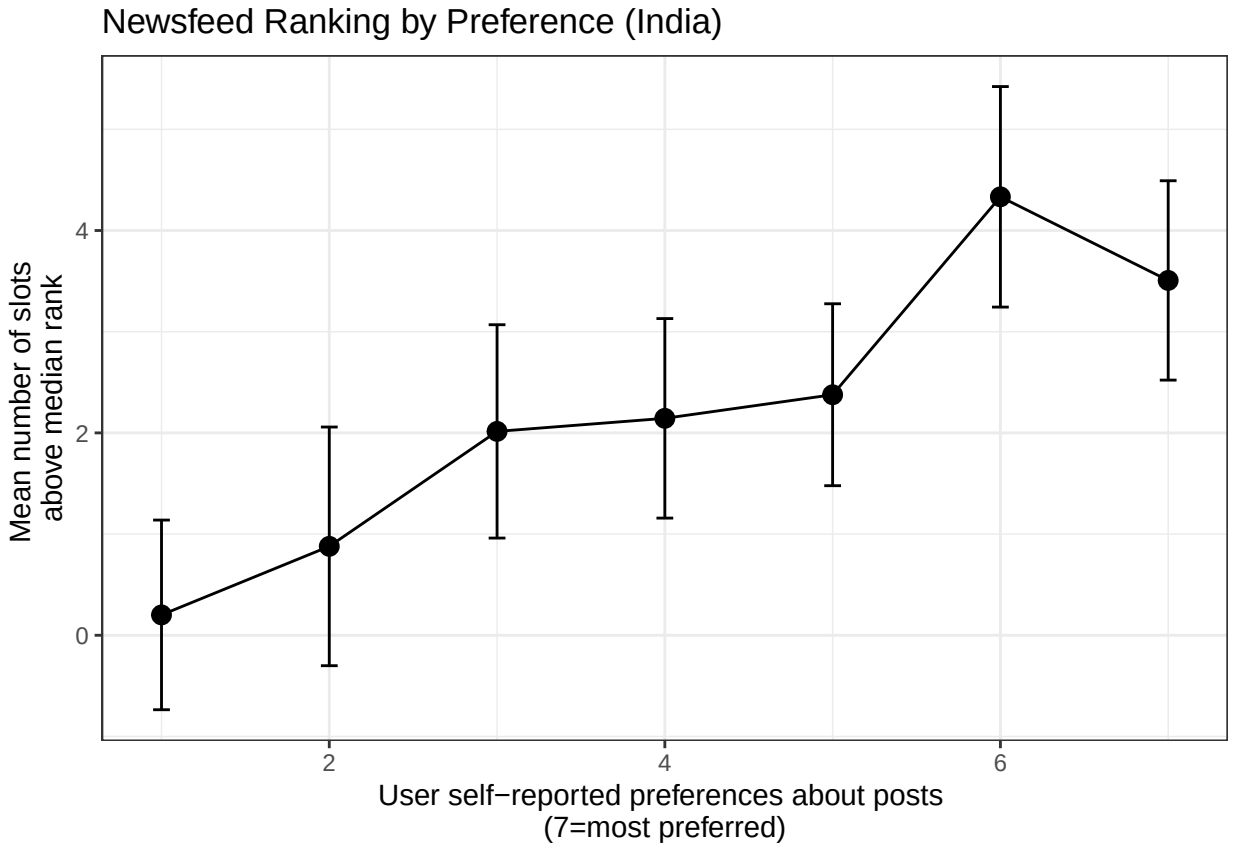

0
20
40
60
nf.order
60
40
20
0
complete_time_rank
density
4e−04
3e−04
2e−04
1e−04

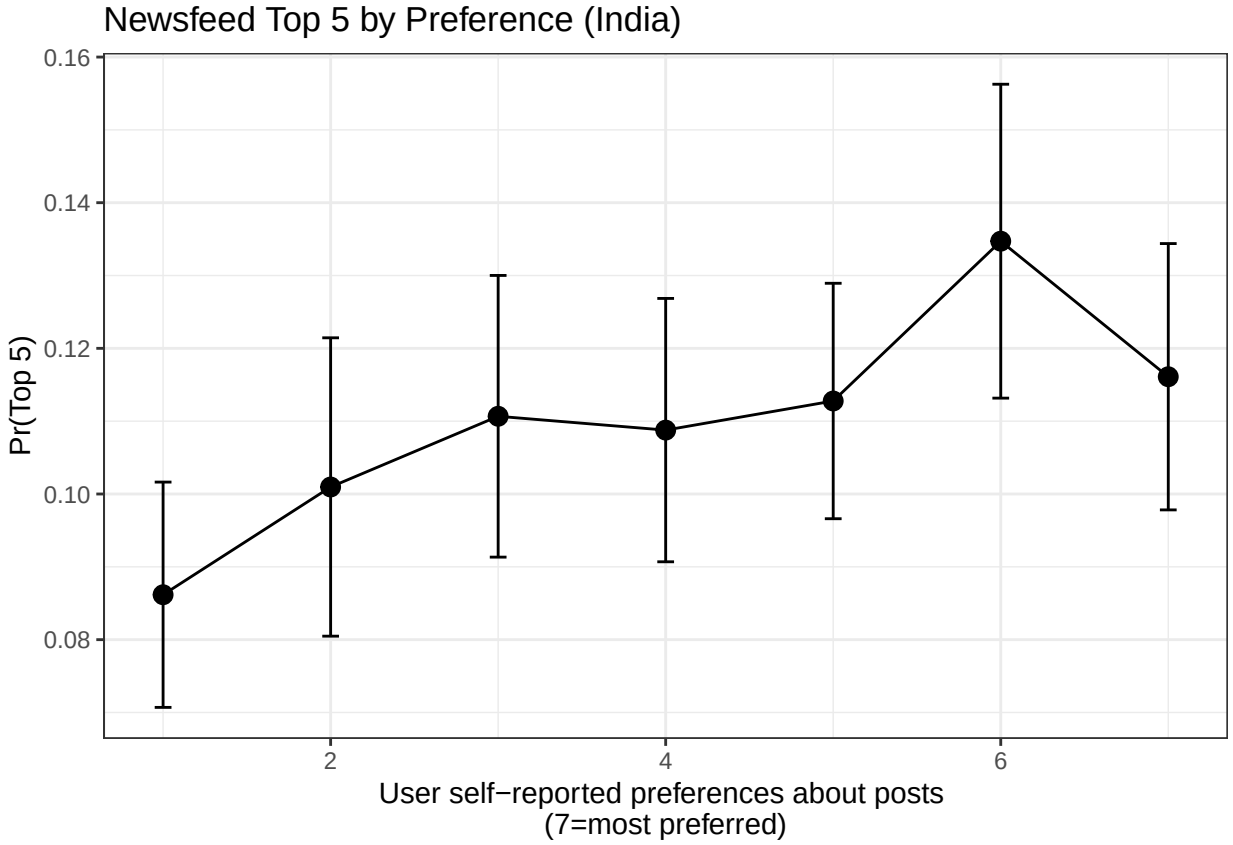

0
20
40
60
nf.order
0.00
0.25
0.50
0.75
1.00
norm.pctle
density
0.020
0.015
0.010
0.005

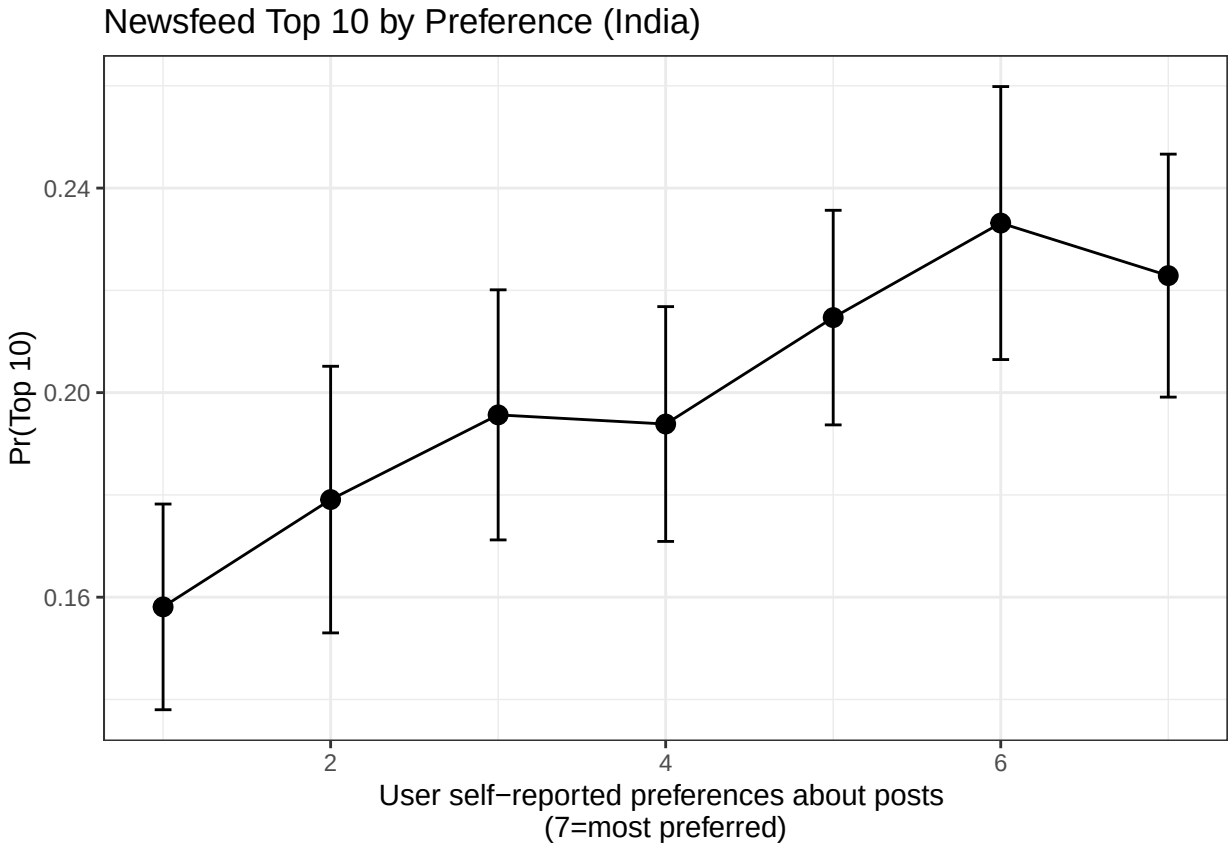

FALSE
TRUE
nf.order
0
20
40
60
1
1
factor(holder)
density
0.018
0.016
0.014
0.012
0.010
0.008
pymk.order
0
20
40
60
60
40
20
0
pct_friend_rank
density
0.00030
0.00025
0.00020
0.00015
0.00010

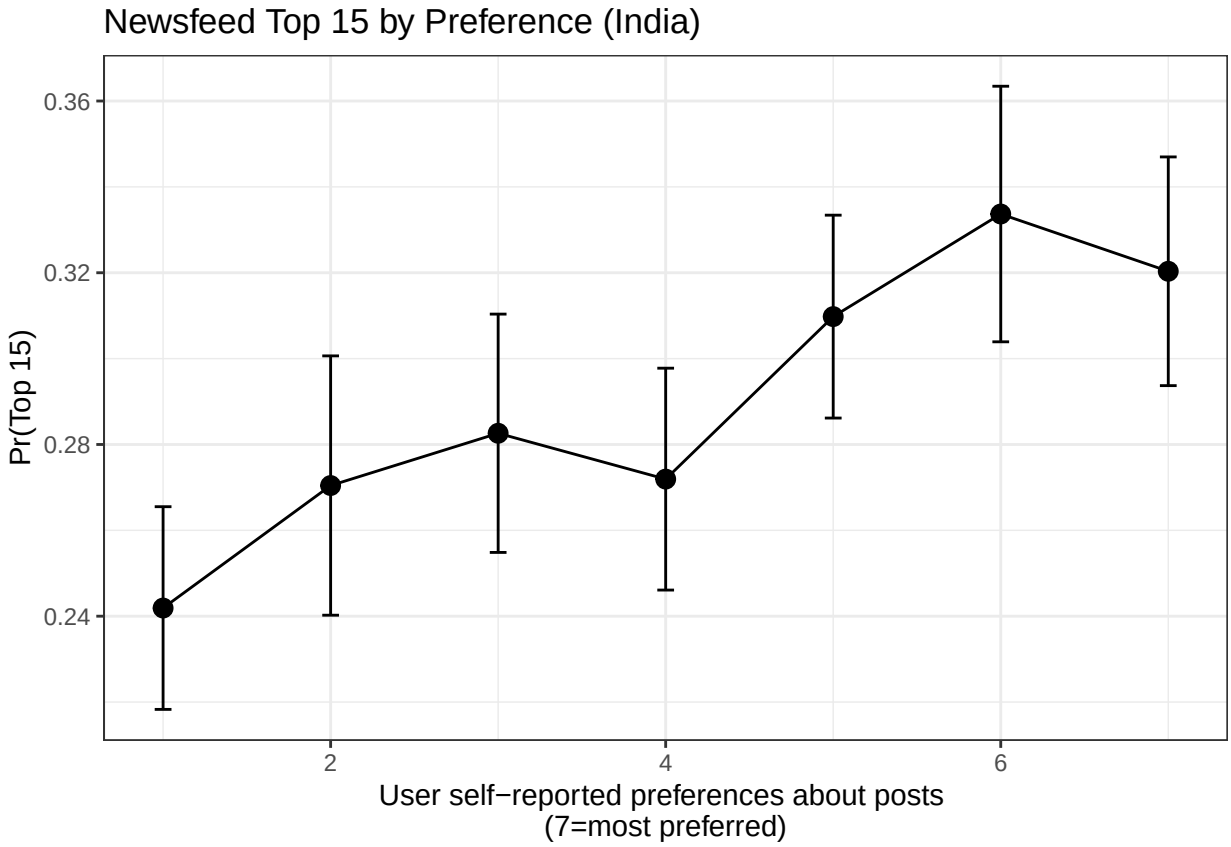

0
20
40
60
pymk.order
0.00
0.25
0.50
0.75
1.00
norm.pctle
density
0.020
0.015
0.010
0.005

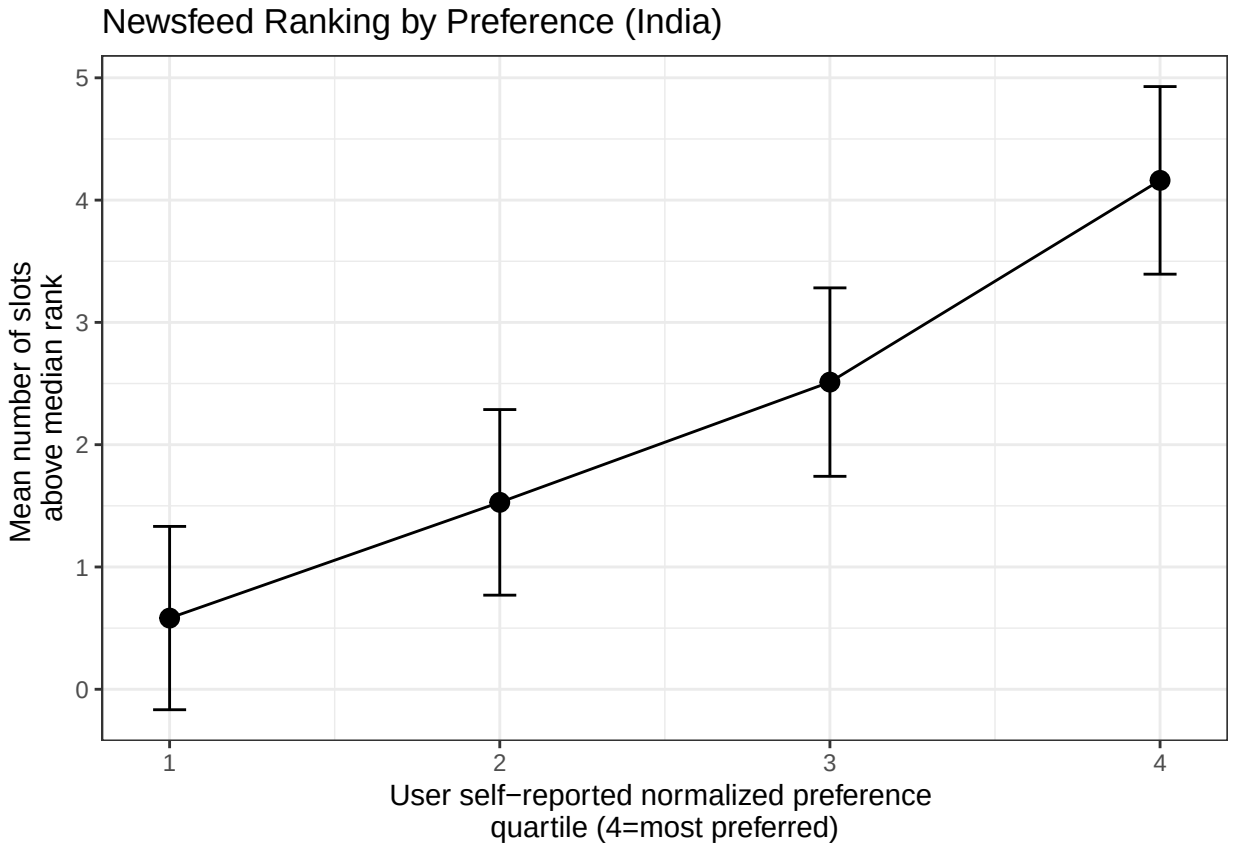

FALSE
TRUE
0
20
40
60
pymk.order
1
1
factor(holder)
density
0.017
0.015
0.013
0.011
0.009

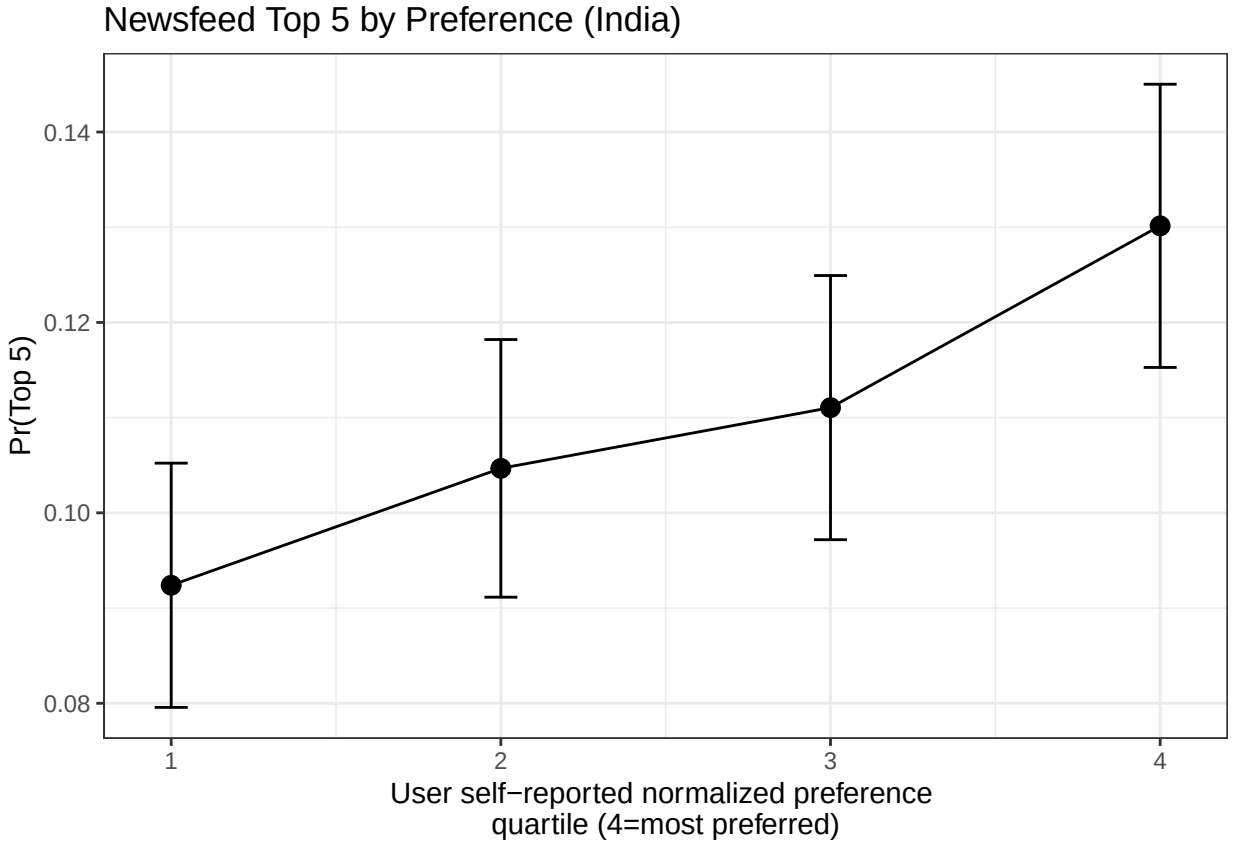

Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
0
2
4
2
4
6
User self−reported preferences about posts (7=most preferred)

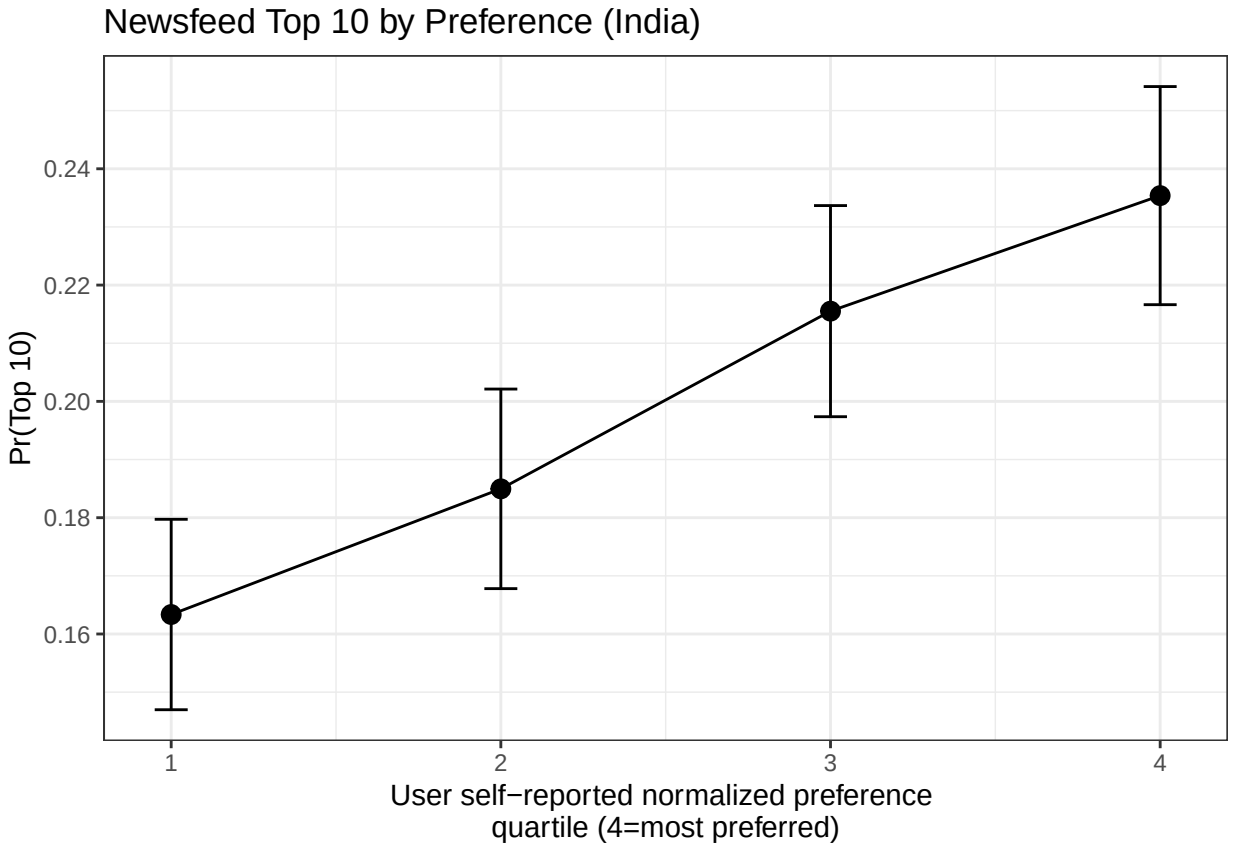

Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.08
0.10
0.12
0.14
0.16
2
4
6
User self−reported preferences about posts (7=most preferred)

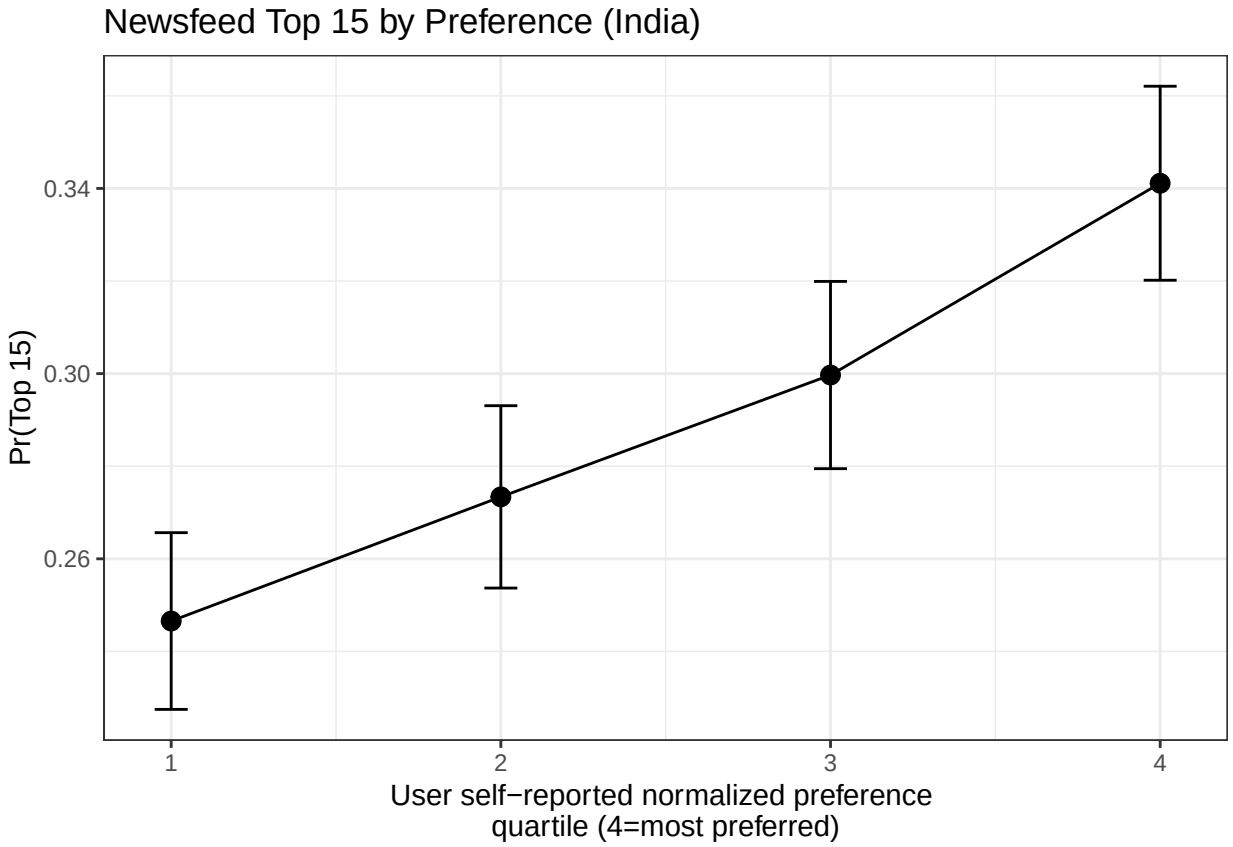

Newsfeed Top 10 by Preference (India)
Pr(Top 10)
0.24
0.20
0.16
2
4
6
User self−reported preferences about posts
(7=most preferred)

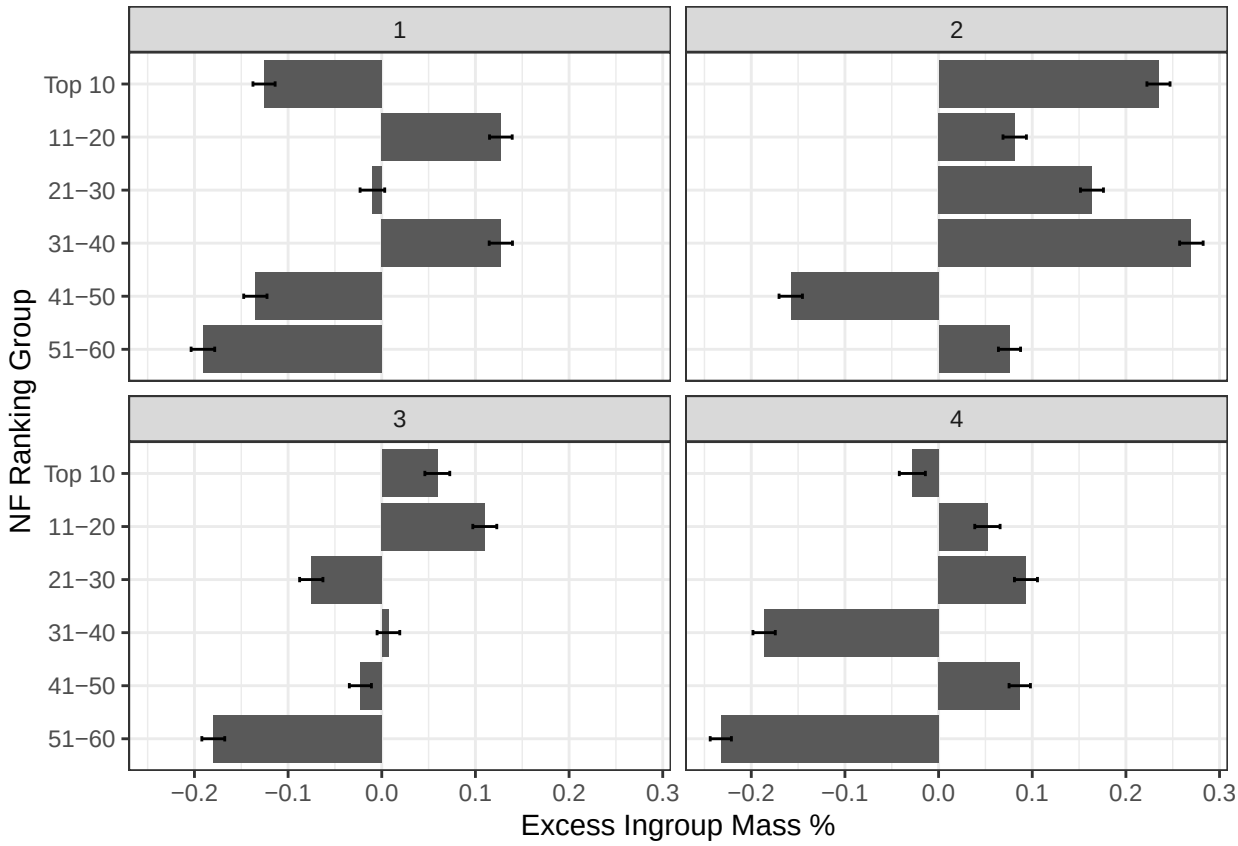

Newsfeed Top 15 by Preference (India)
Pr(Top 15)
0.36
0.32
0.28
0.24
2
4
6
User self−reported preferences about posts
(7=most preferred)

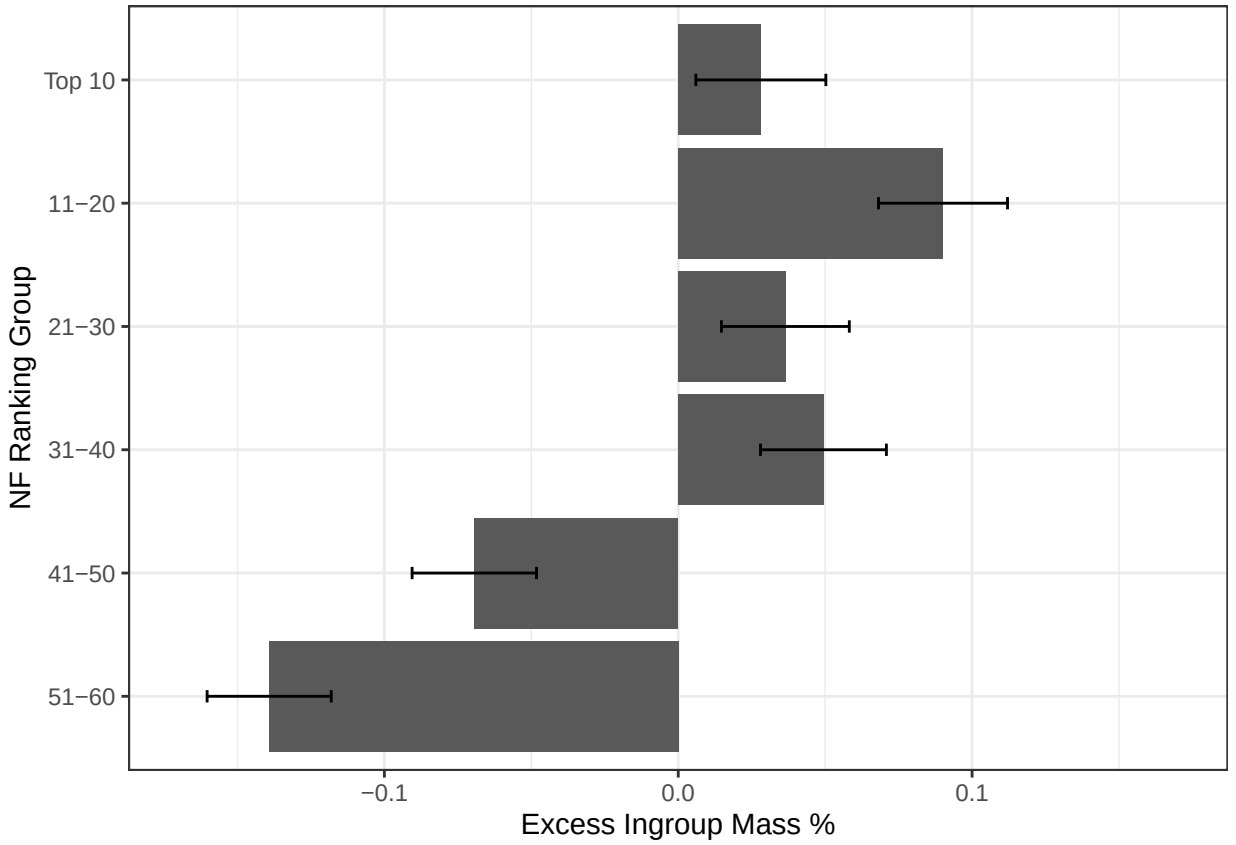

Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
0
1
2
3
4
5
1
2
3
4
User self−reported normalized preference quartile (4=most preferred)

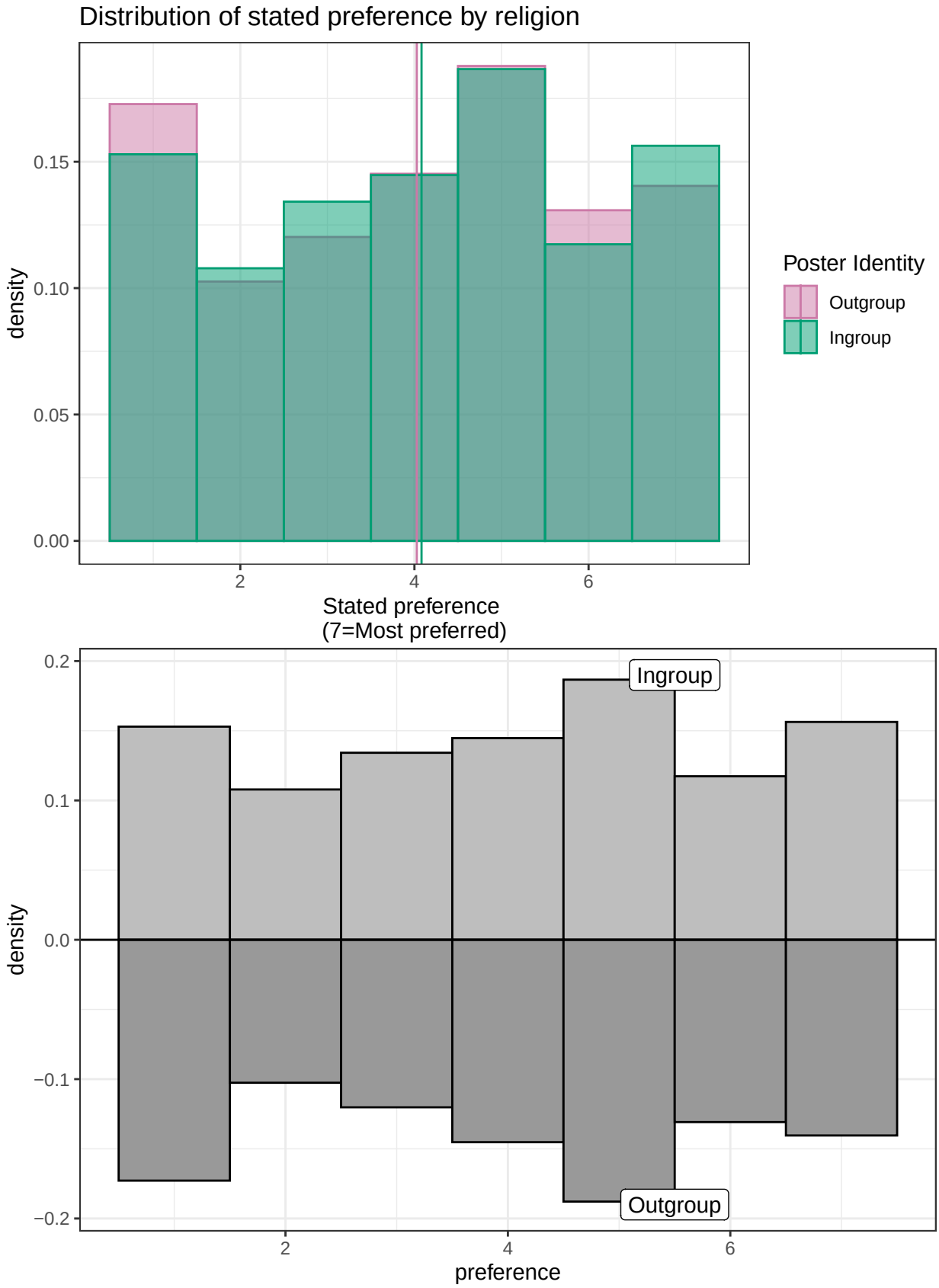

Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.08
0.10
0.12
0.14
1
2
3
4
User self−reported normalized preference quartile (4=most preferred)

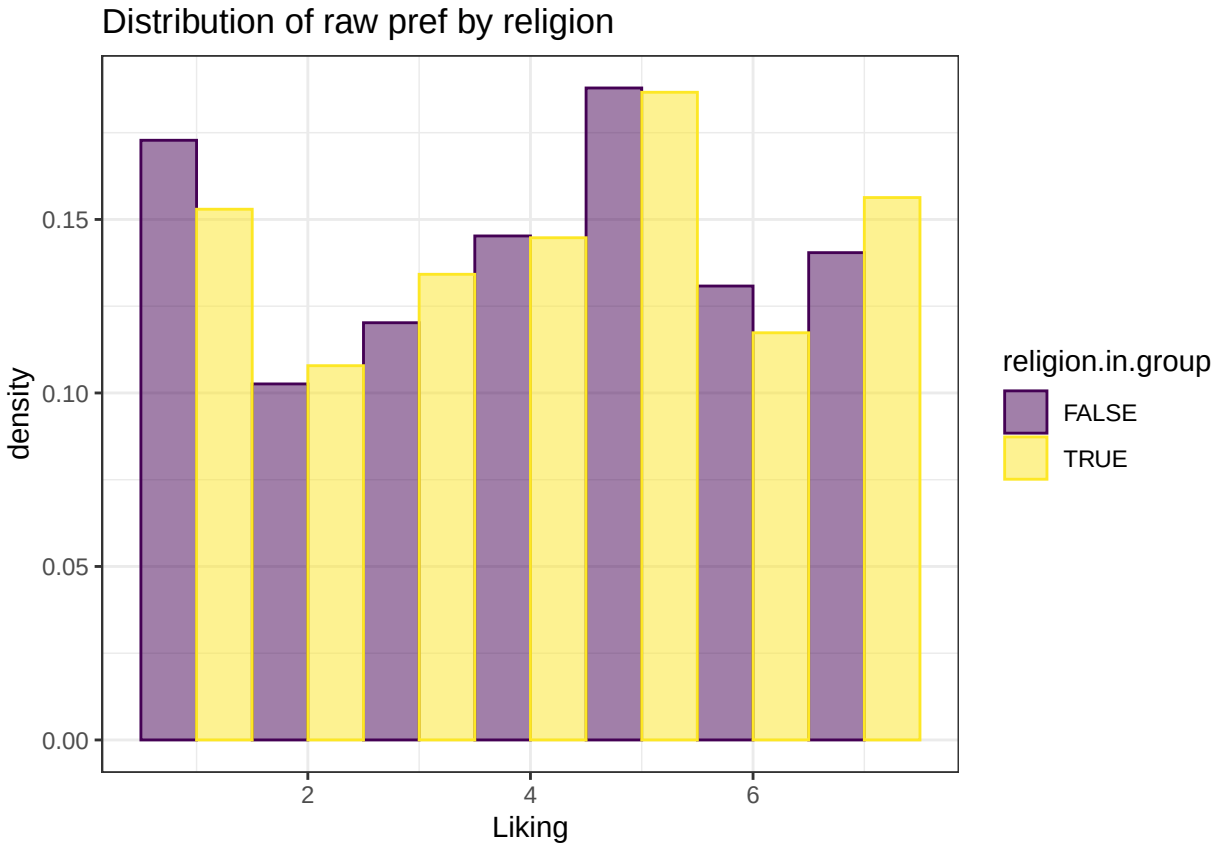

Newsfeed Top 10 by Preference (India)
Pr(Top 10)
0.24
0.22
0.20
0.18
0.16
1
2
3
4
User self−reported normalized preference
quartile (4=most preferred)

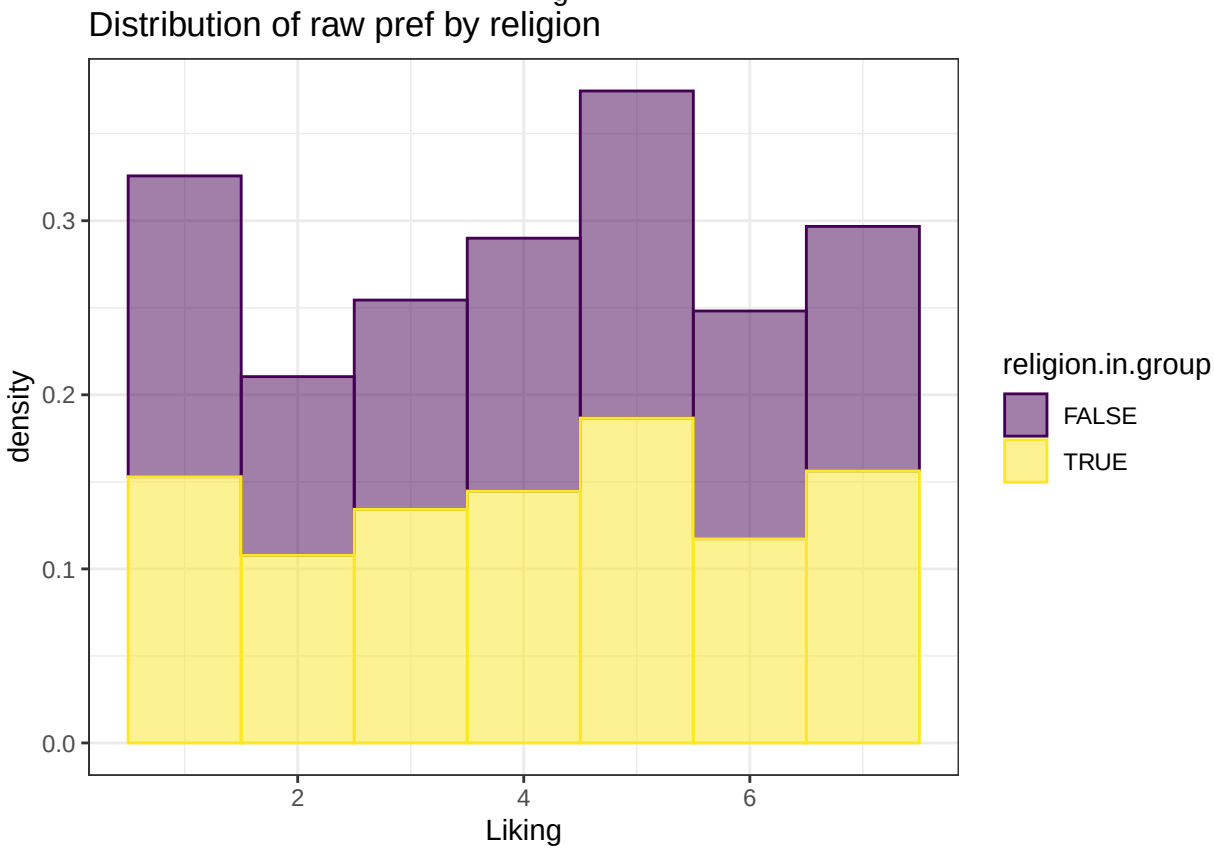

Newsfeed Top 15 by Preference (India)
Pr(Top 15)
0.34
0.30
0.26
1
2
3
4
User self−reported normalized preference
quartile (4=most preferred)

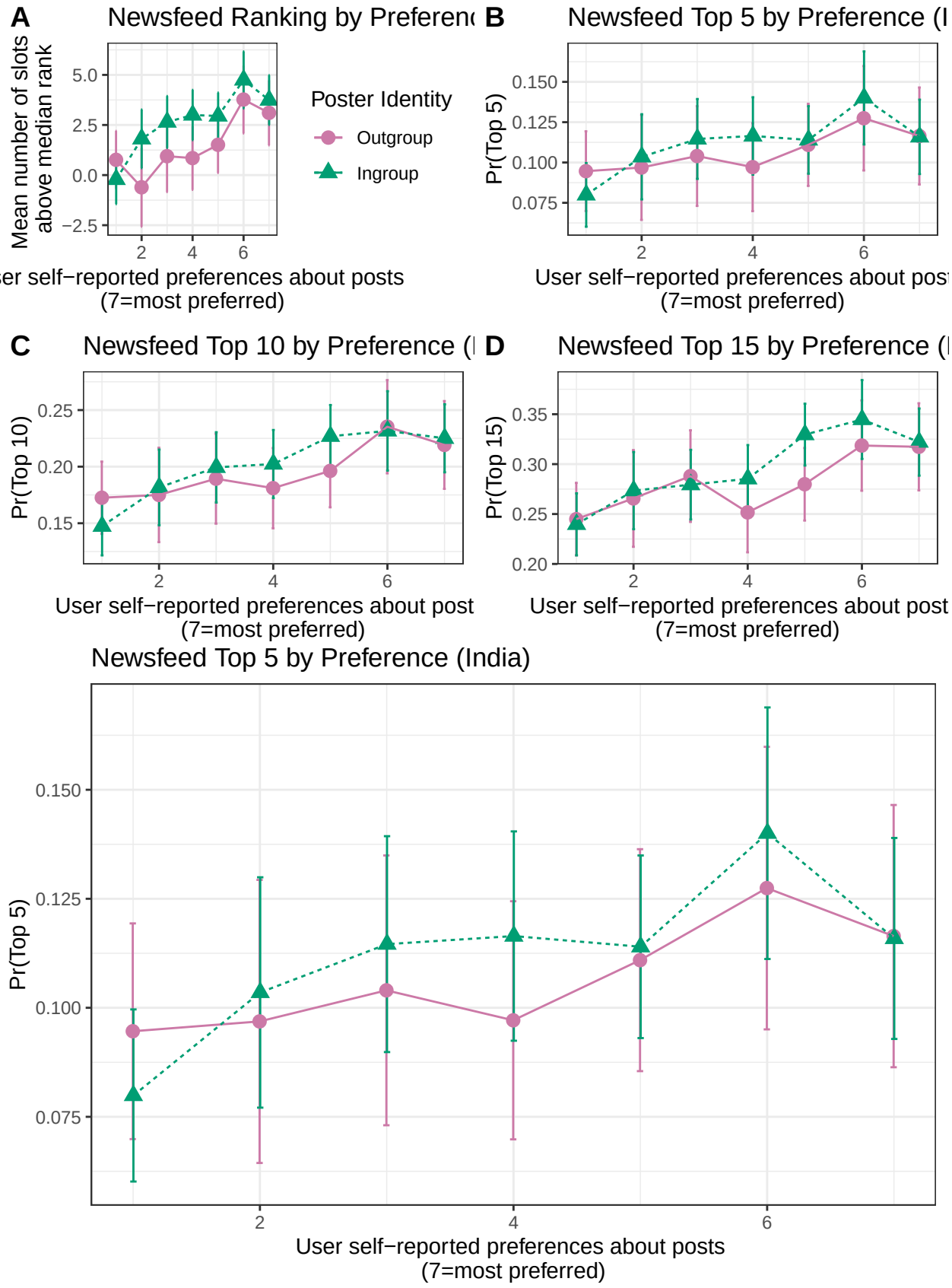

1
2
3
4
Top 10
11−20
21−30
31−40
41−50
51−60
NF Ranking Group
−0.2
−0.1
0.0
0.1
0.2
0.3
Excess Ingroup Mass %

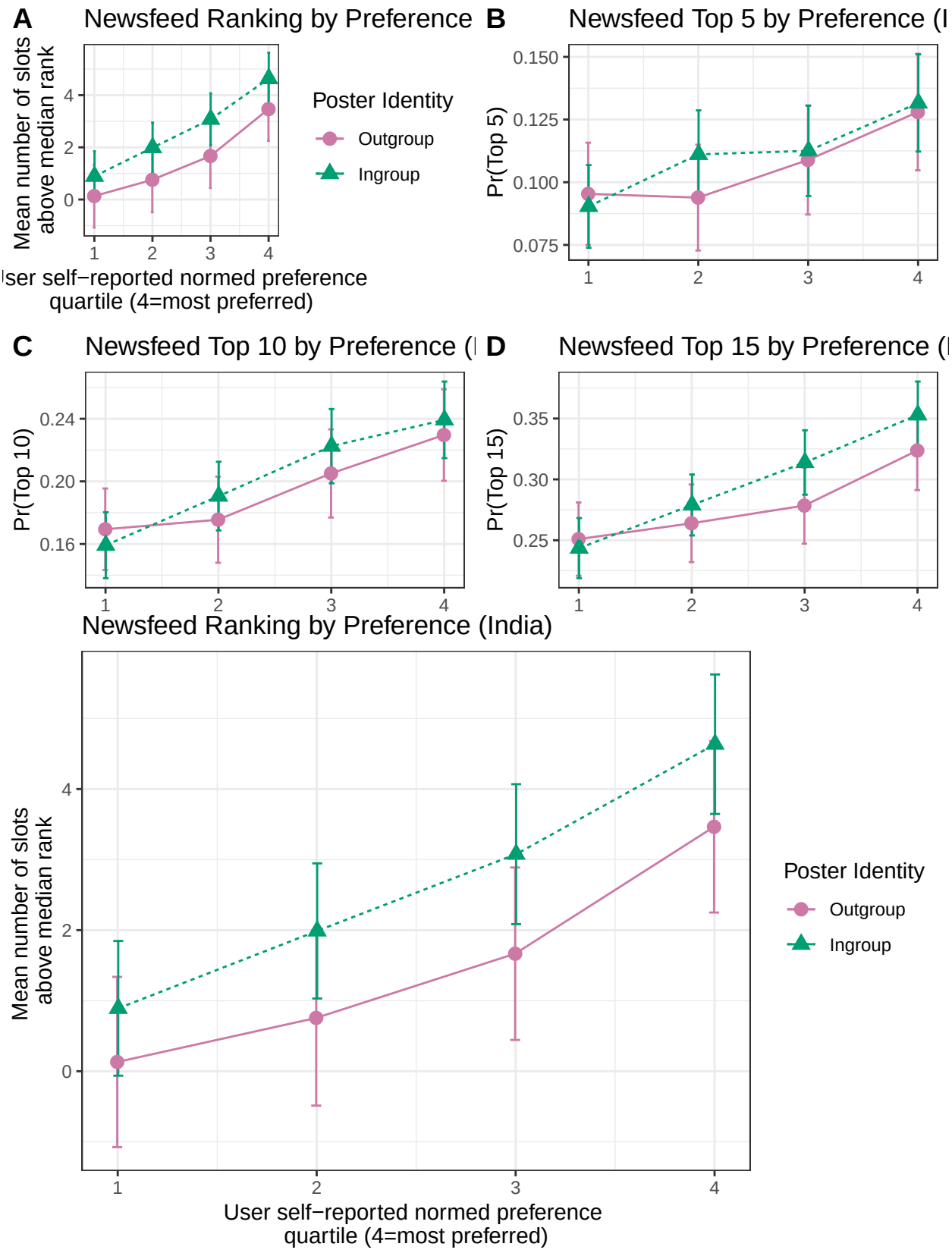

Top 10
11−20
21−30
31−40
41−50
51−60
NF Ranking Group
−0.1
0.0
0.1
Excess Ingroup Mass %

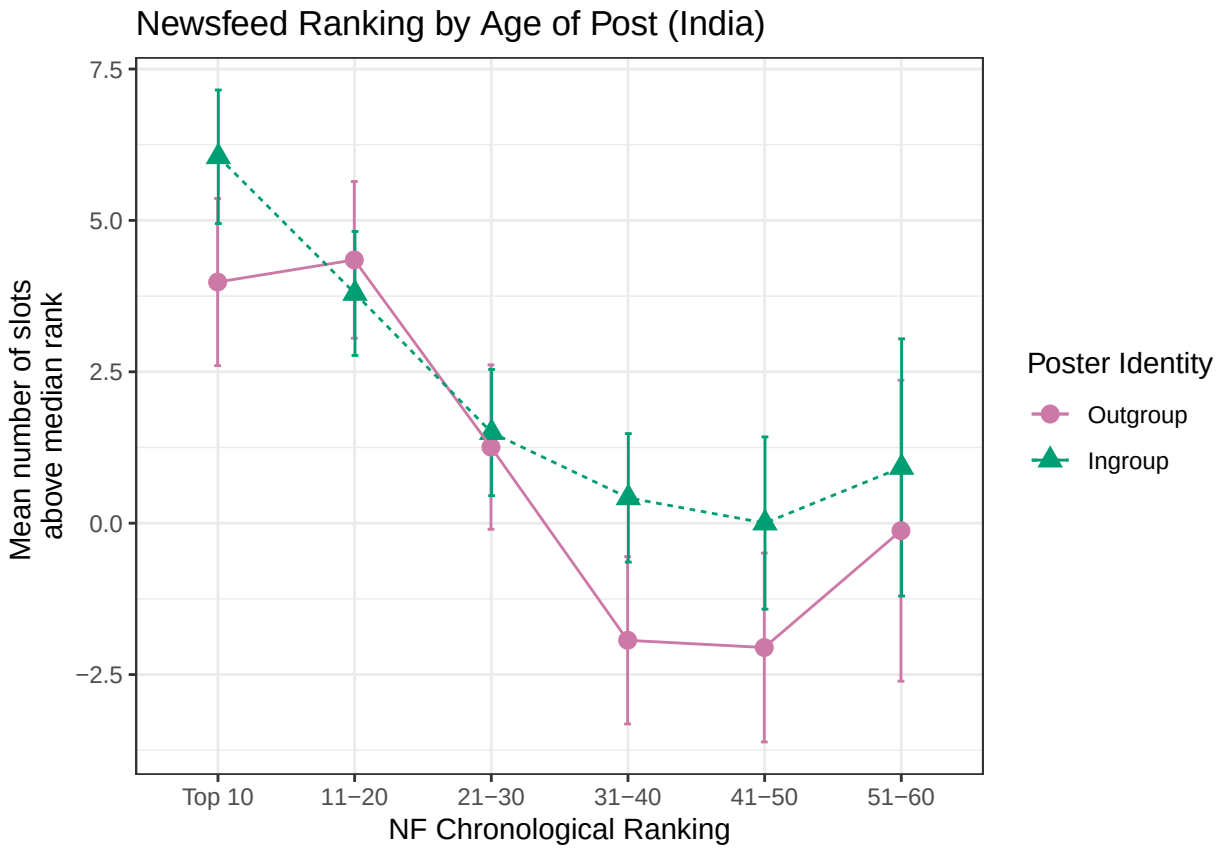

Distribution of stated preference by religion
density
0.15
0.10
0.05
0.00
2
4
6
Stated preference
(7=Most preferred)
Poster Identity
Outgroup
Ingroup
density
0.2
0.1
0.0
−0.1
−0.2
Ingroup
Outgroup
2
4
6
preference


Distribution of raw pref by religion
density
0.15
0.10
0.05
0.00
2
4
6
Liking
religion.in.group
FALSE
TRUE

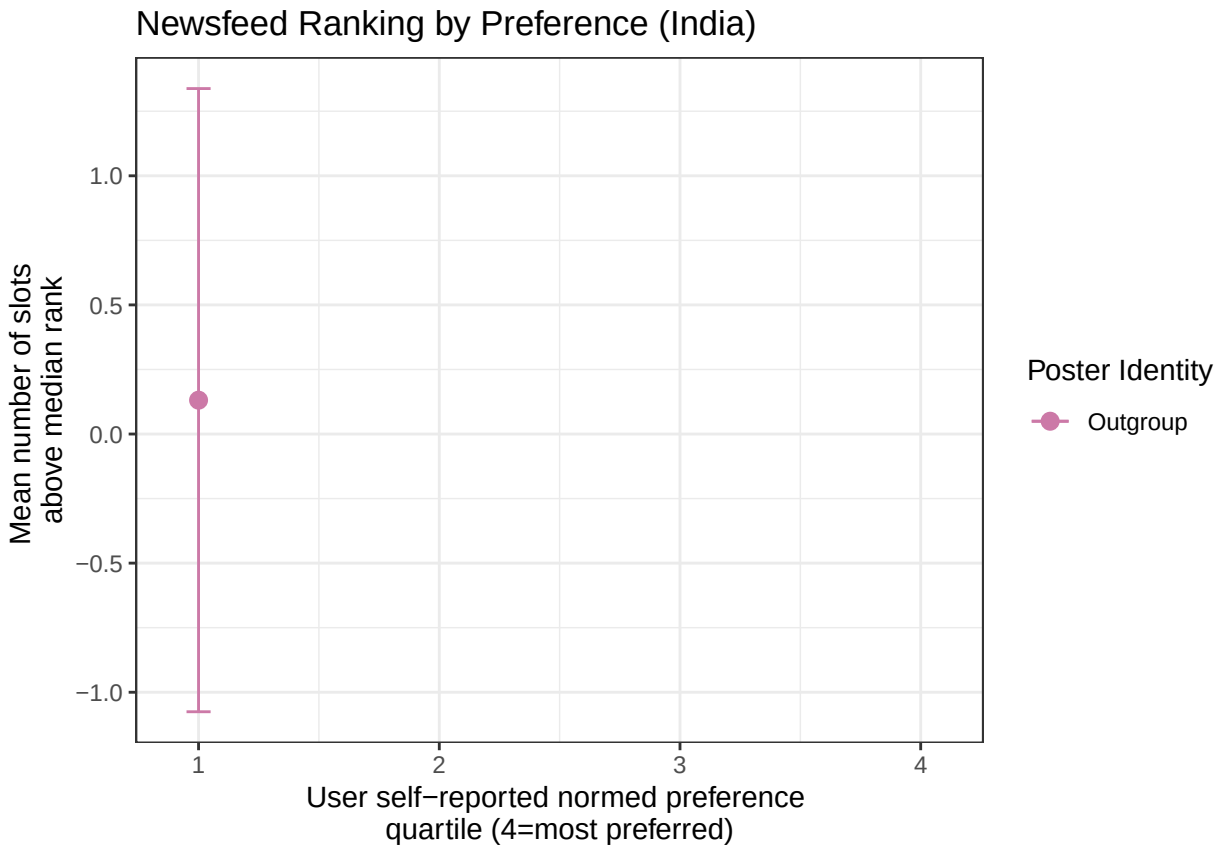

Distribution of raw pref by religion
density
0.3
0.2
0.1
0.0
2
4
6
Liking
religion.in.group
FALSE
TRUE


A
Newsfeed Ranking by Preferen
Mean number of slots above median rank
5.0
2.5
0.0
−2.5
2
4
6
er self−reported preferences about posts
(7=most preferred)
Poster Identity
Outgroup
Ingroup
B
Newsfeed Top 5 by Preference (I
Pr(Top 5)
0.150
0.125
0.100
0.075
2
4
6
User self−reported preferences about pos
(7=most preferred)
C
Newsfeed Top 10 by Preference (I
Pr(Top 10)
0.25
0.20
0.15
2
4
6
User self−reported preferences about post
(7=most preferred)
D
Newsfeed Top 15 by Preference (I
Pr(Top 15)
0.35
0.30
0.25
0.20
2
4
6
User self−reported preferences about post
(7=most preferred)
Newsfeed Top 5 by Preference (India)
Pr(Top 5)
0.150
0.125
0.100
0.075
2
4
6
User self−reported preferences about posts
(7=most preferred)

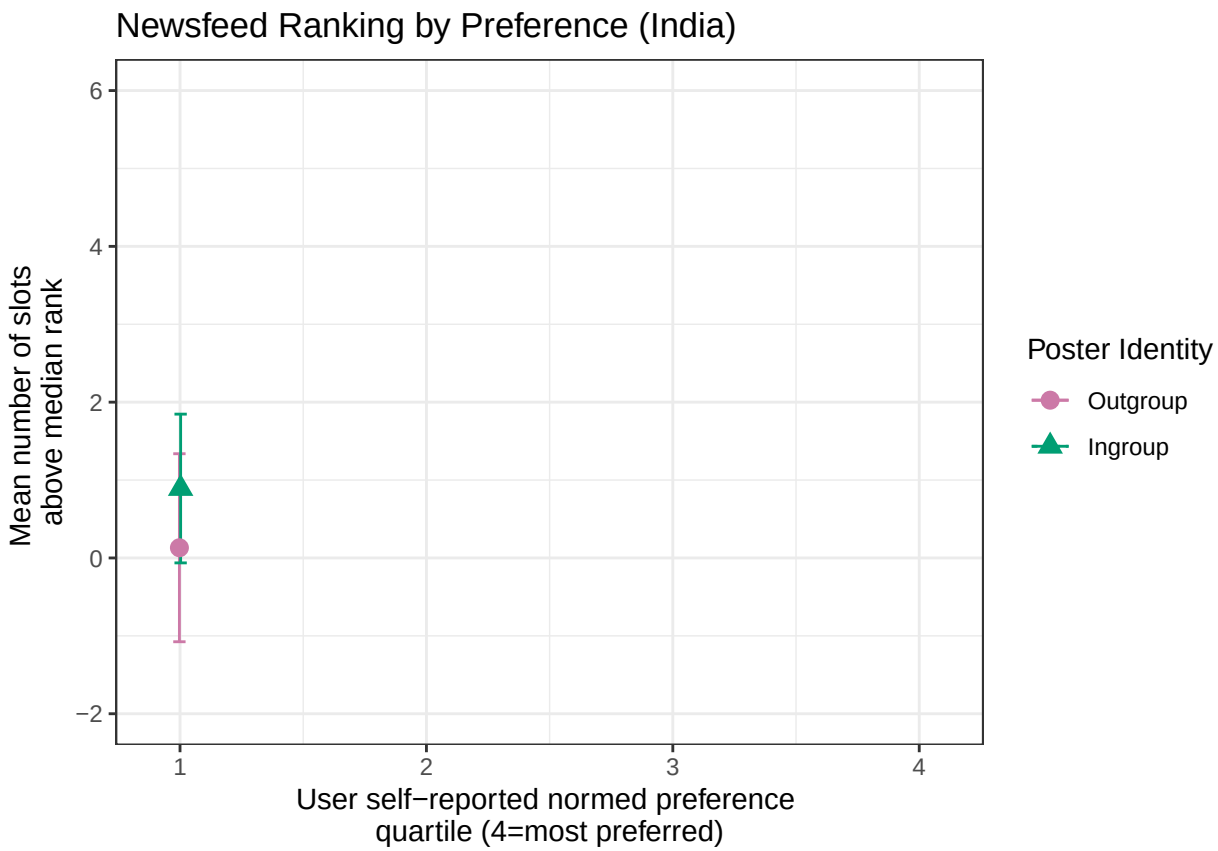

A
Newsfeed Ranking by Preference
Mean number of slots above median rank
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup
B
Newsfeed Top 5 by Preference (I
Pr(Top 5)
C
Newsfeed Top 10 by Preference (I
Pr(Top 10)
D
Newsfeed Top 15 by Preference (I
Pr(Top 15)
Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup

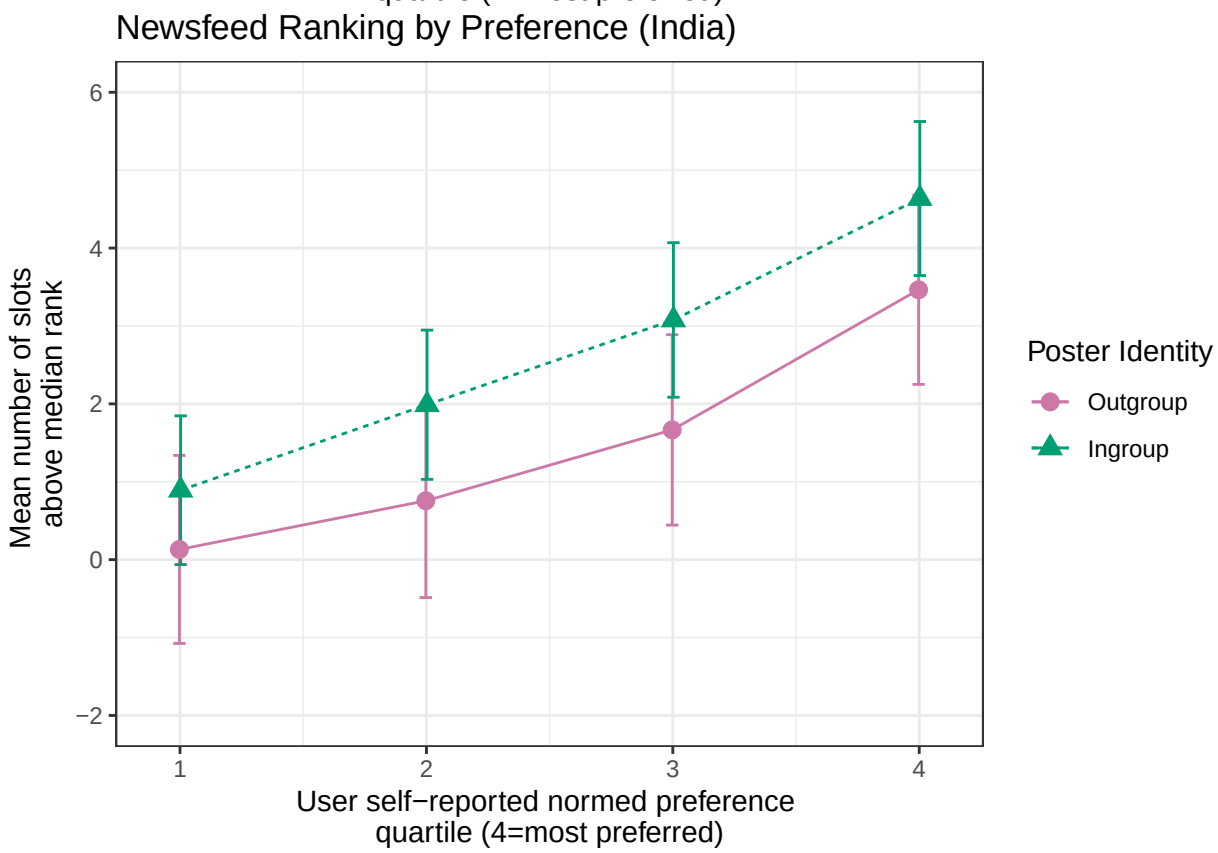


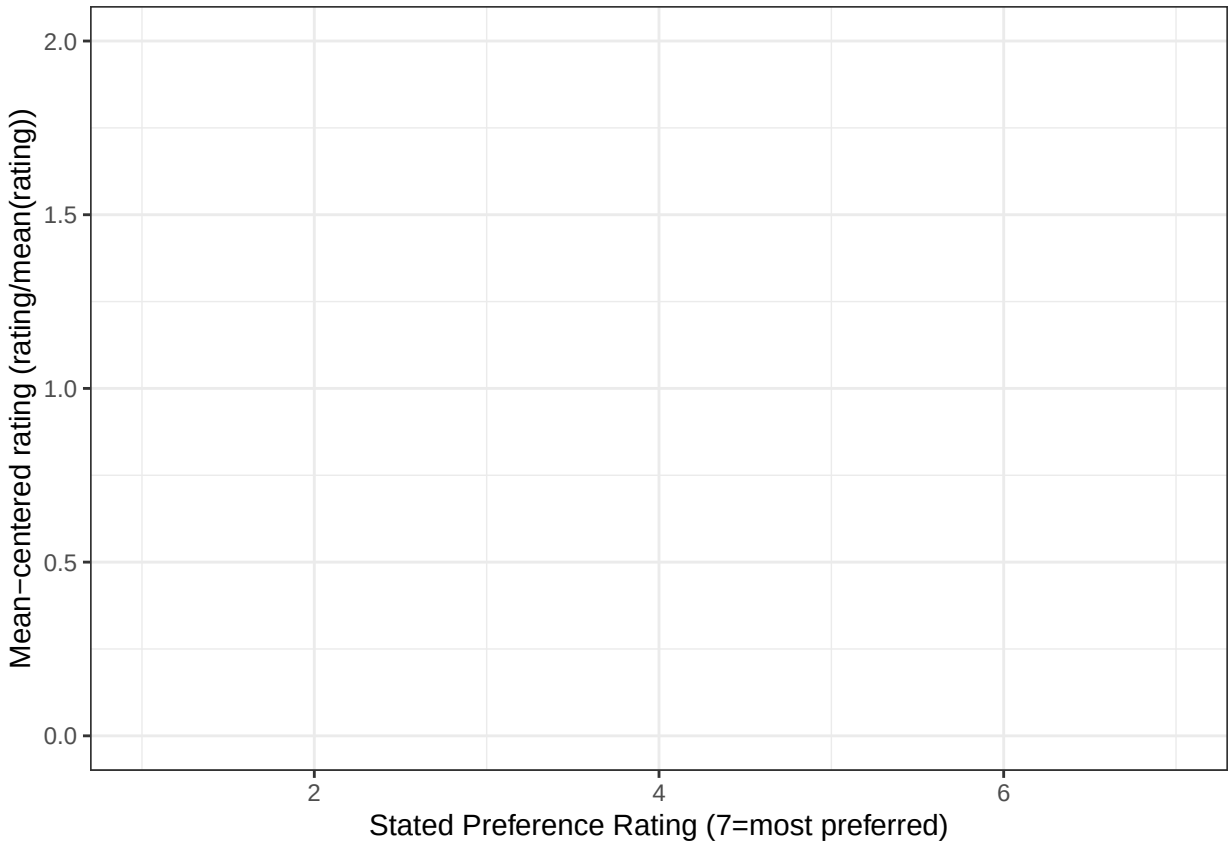

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

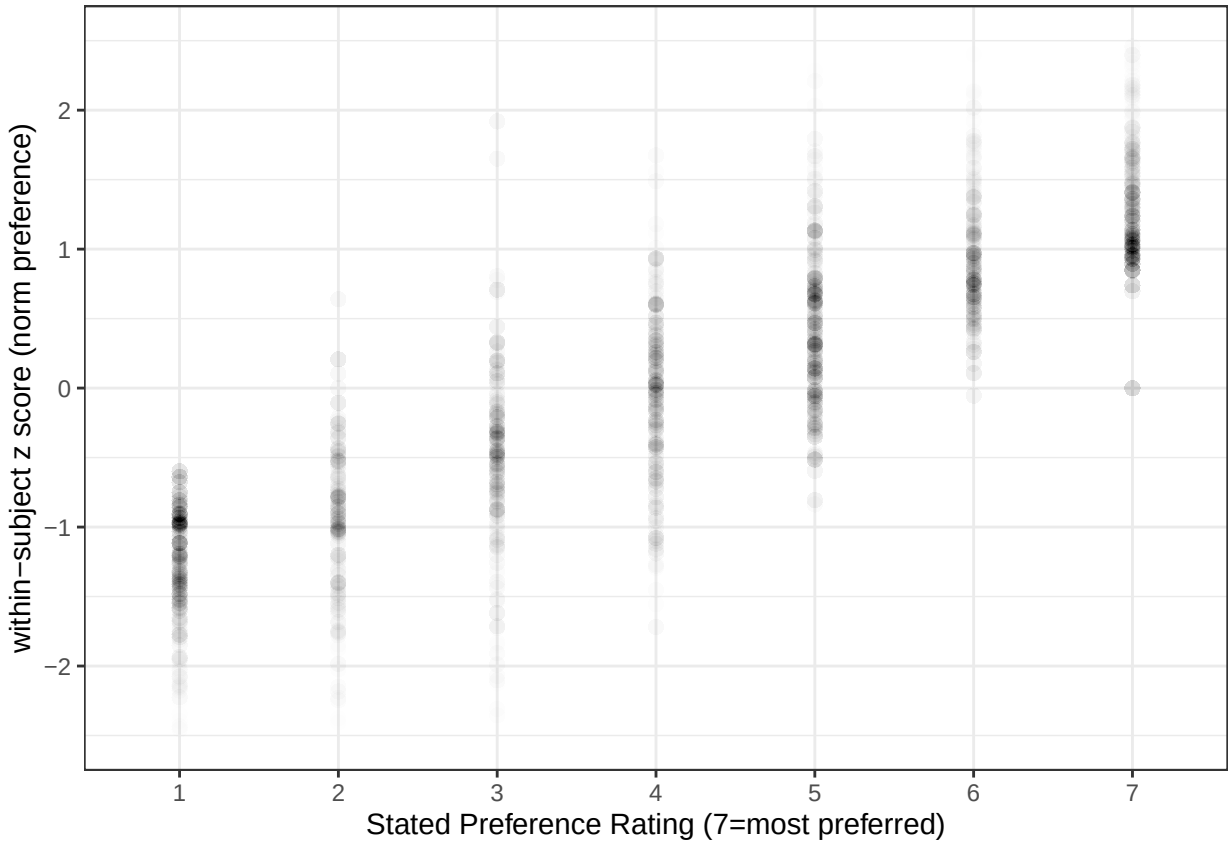


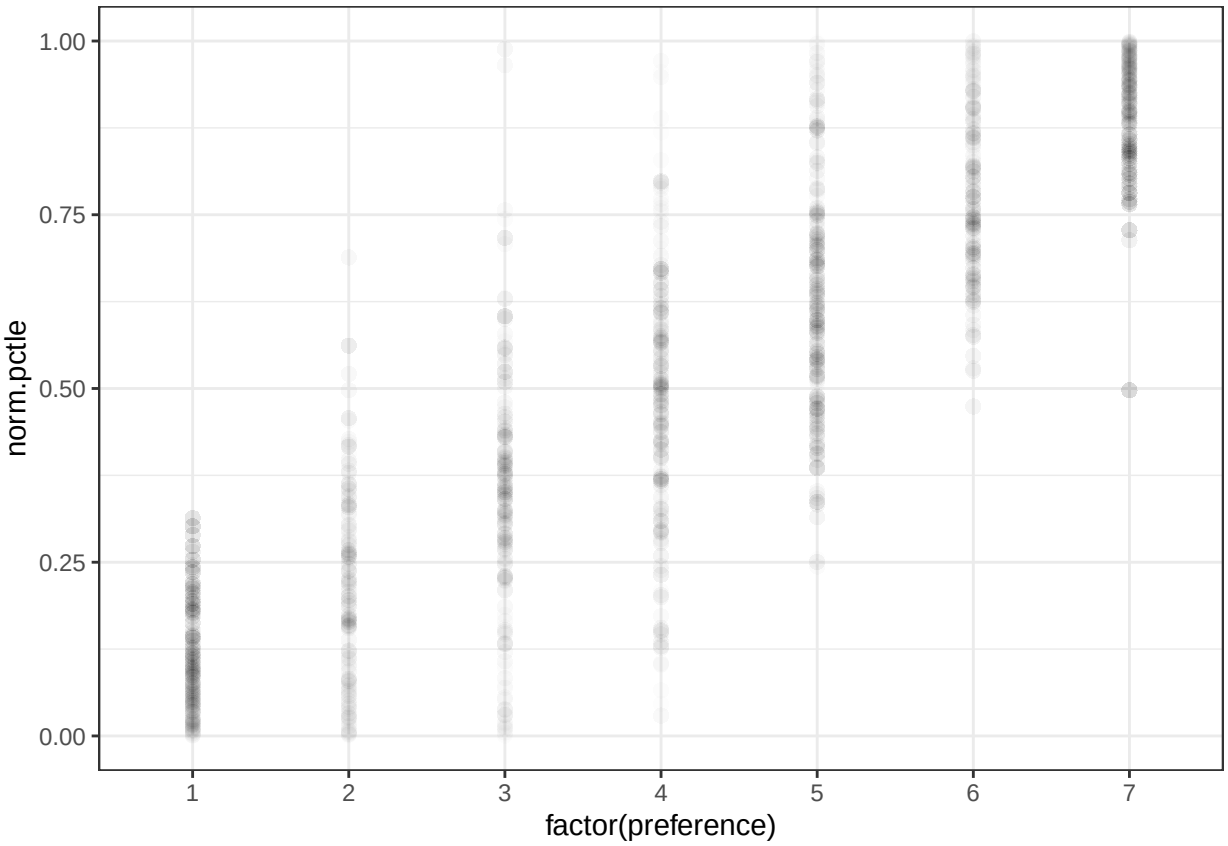

```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```


Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup


Newsfeed Ranking by Preference (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User self−reported normed preference quartile (4=most preferred)
Poster Identity
Outgroup
Ingroup

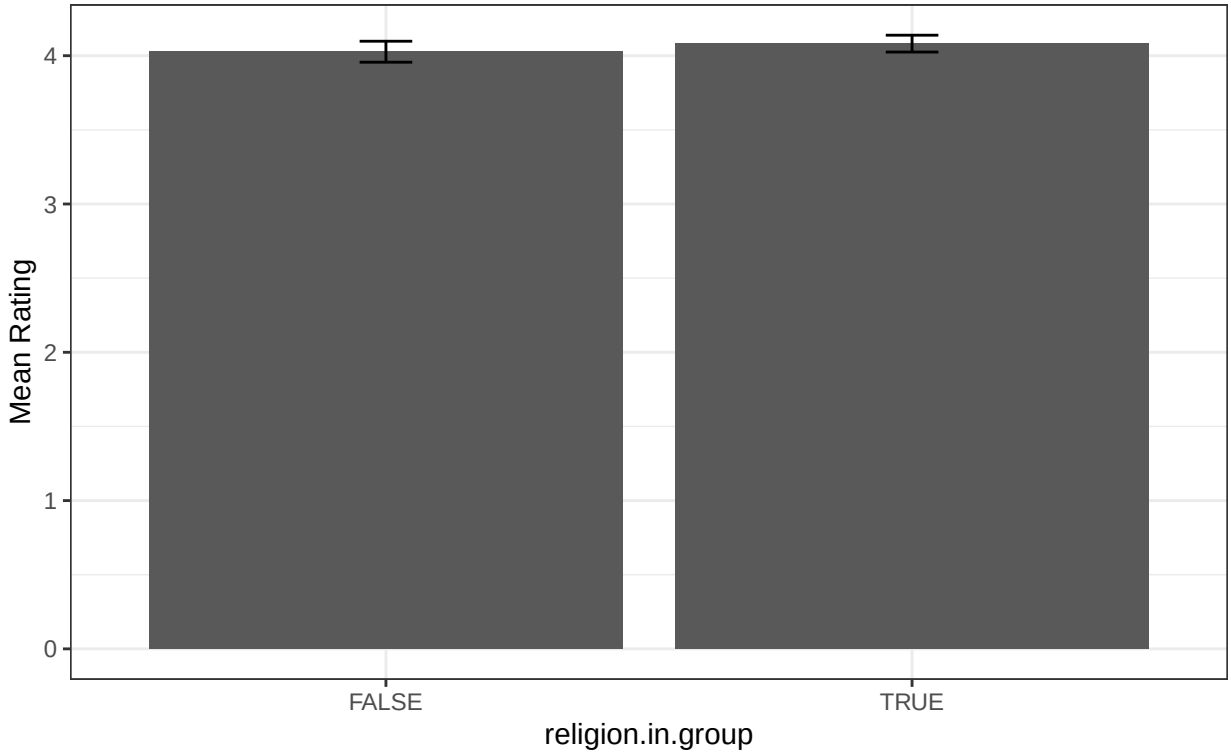

Mean−centered rating (rating/mean(rating))
2.0
1.5
1.0
0.5
0.0
2
4
6
Stated Preference Rating (7=most preferred)


within−subject z score (norm preference)
2
1
0
−1
−2
1
2
3
4
5
6
7
Stated Preference Rating (7=most preferred)

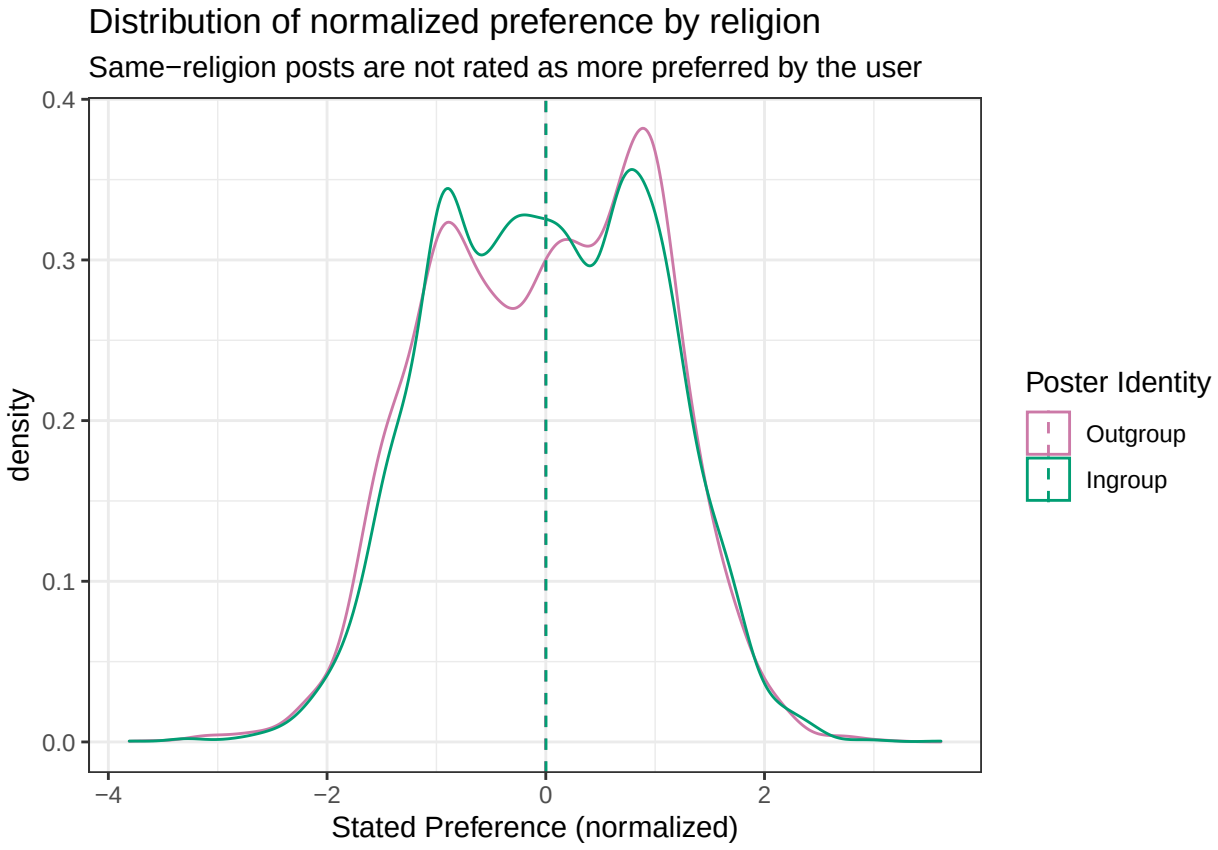


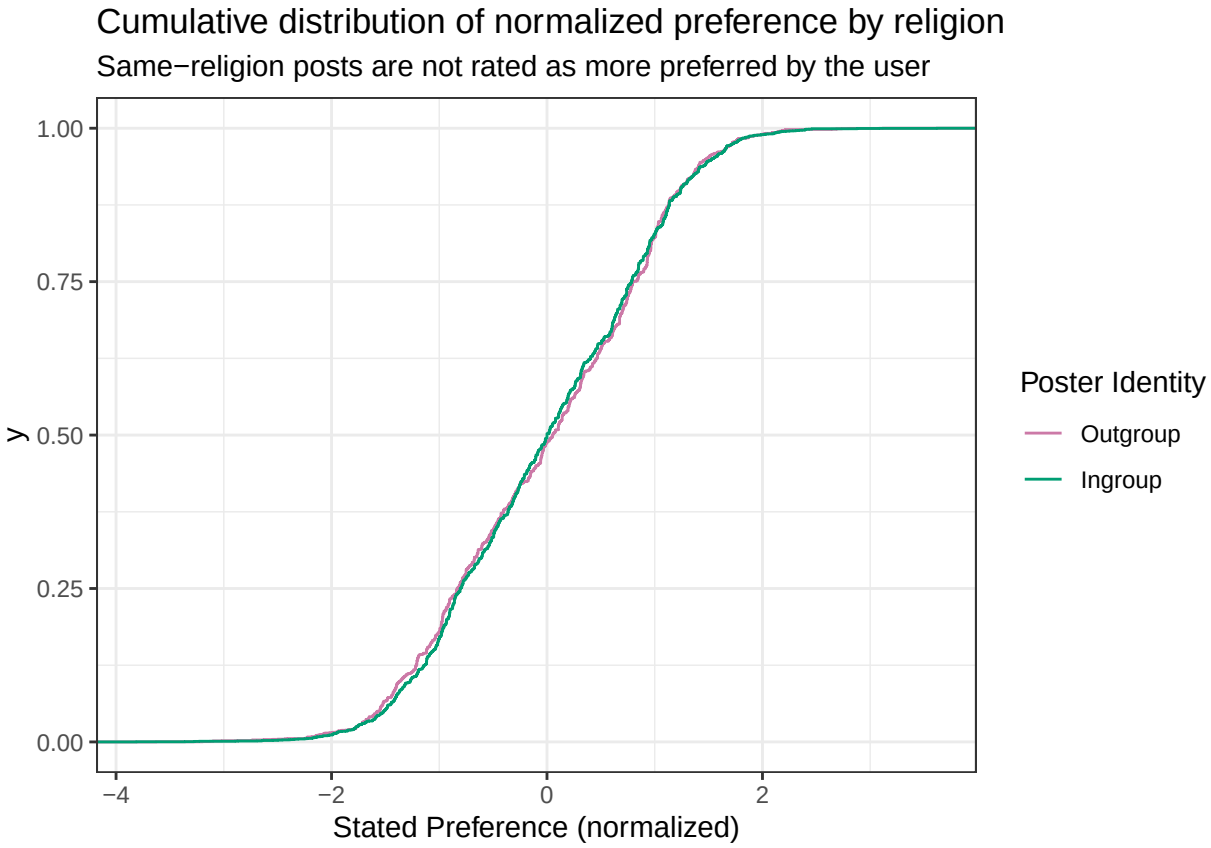
Raw Reported Preference by Race Group

Same−religion posts are slightly more preferred



```
## Adding missing grouping variables: `dedupid`
```






```
## Adding missing grouping variables: `dedupid`
## Adding missing grouping variables: `dedupid`
```

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:05:27

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:05:27

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:05:27

Table 6: Time Results - Rank

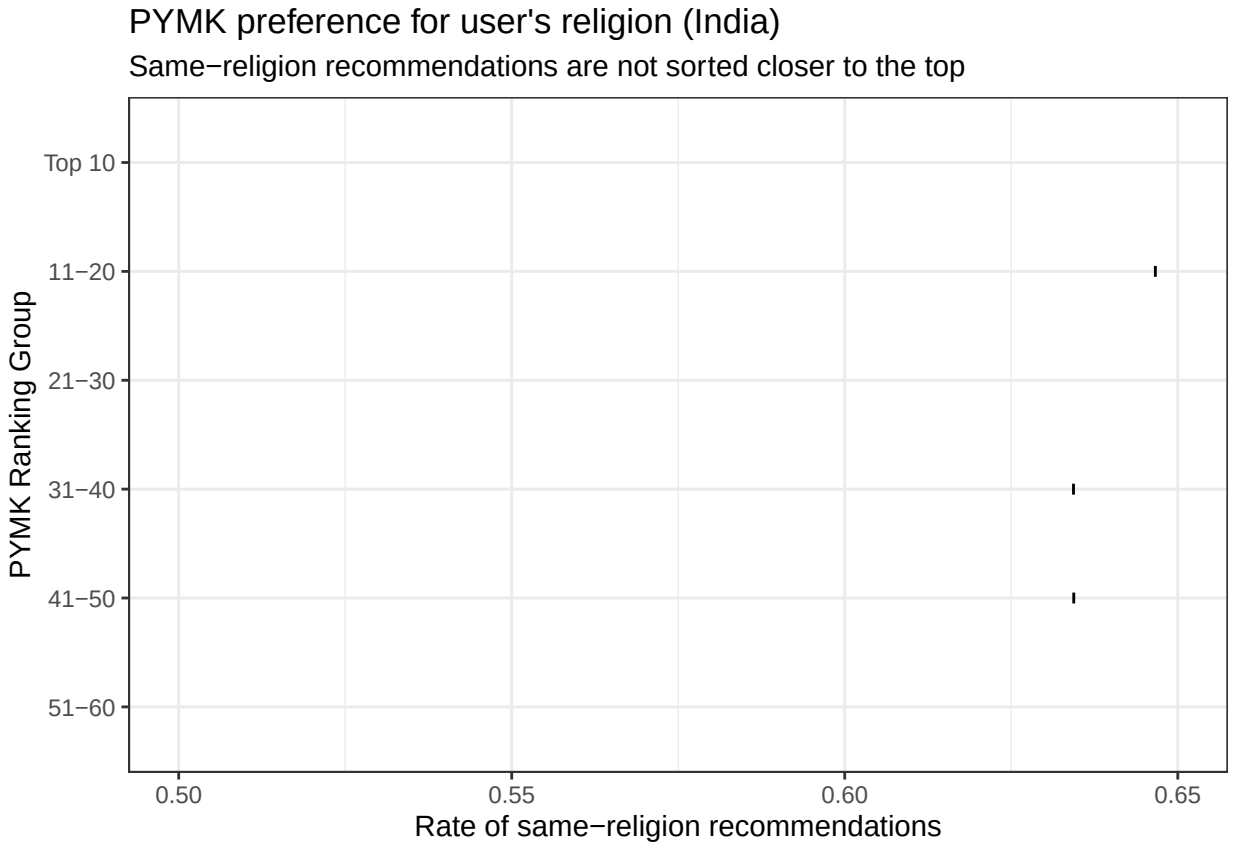
	Dependent variable:		
	nf.order		
	(1)	(2)	(3)
	all	all2	base
I(100 ∗norm.pctle)	−0.048***	−0.048***	−0.047***
	(0.007)	(0.007)	(0.007)
time_rank	0.164***	0.150***	
	(0.021)	(0.013)	
religion.in.group	−0.510	−1.078***	−1.126***
	(0.736)	(0.394)	(0.397)
time_rank:religion.in.group	−0.024		
	(0.027)		
Constant	27.529***	27.864***	31.340***
	(0.657)	(0.545)	(0.457)
Observations	7,866	7,866	7,866
R^2	0.024	0.023	0.007
Adjusted R^2	0.023	0.023	0.007
Note:			*p<0.1; **p<0.05; ***p<0.01

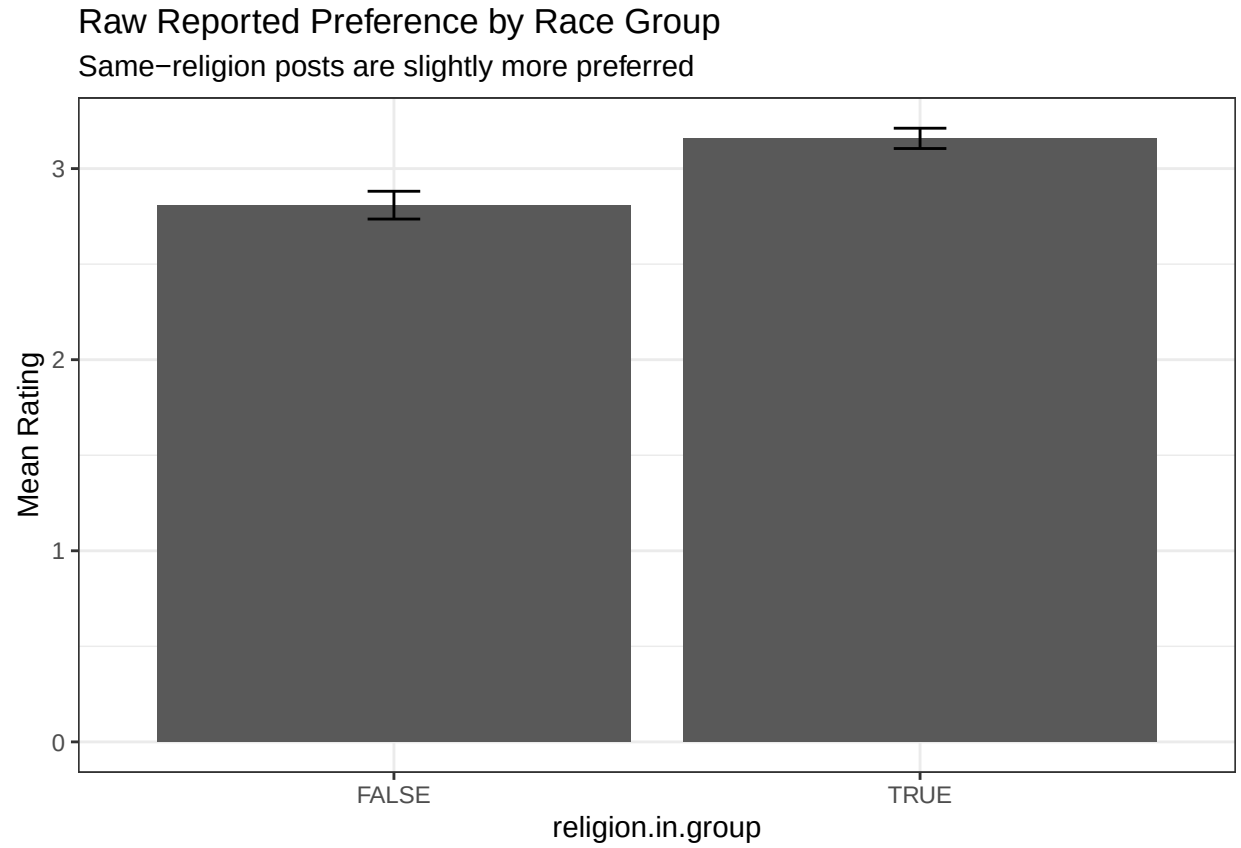
Table 7: Time Results - Top 10

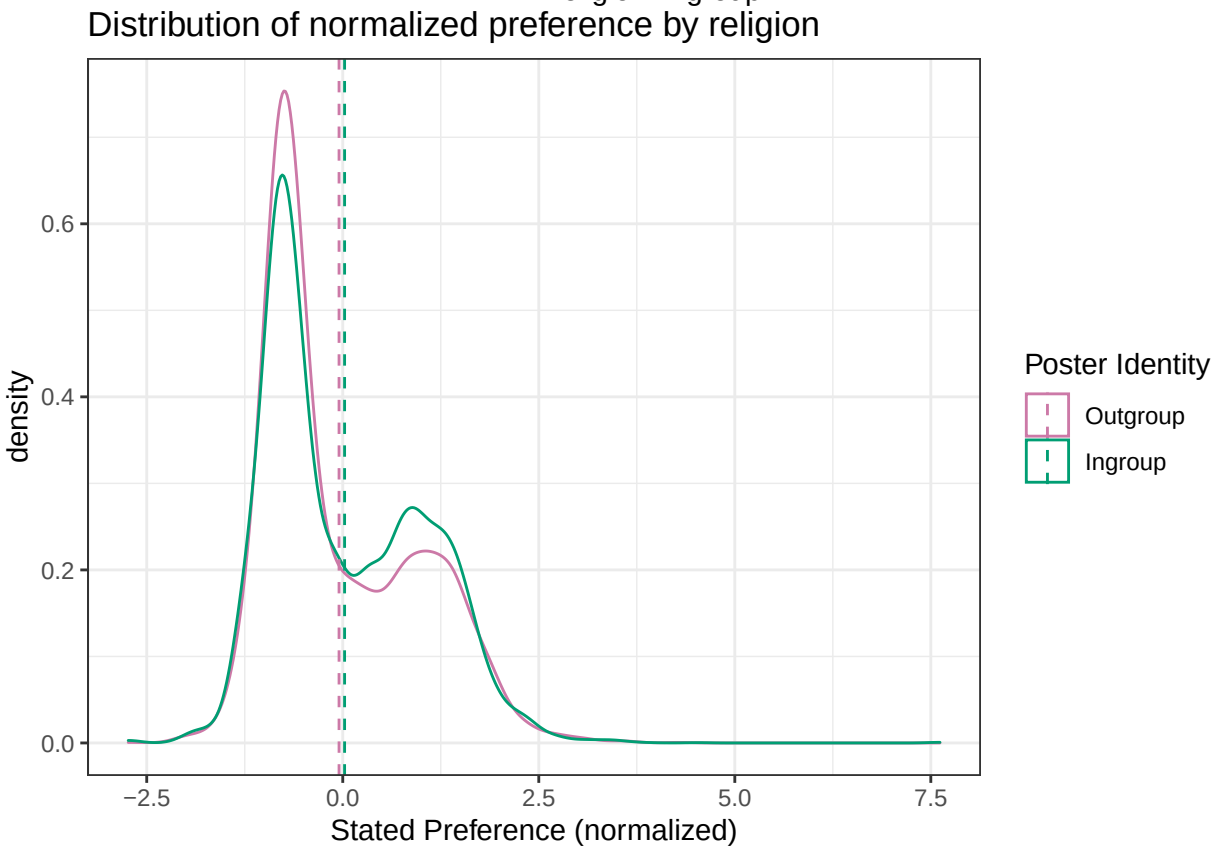
	Dependent variable:			
	nf.order			
	(1)	(2)	(3)	(4)
	all	days	hours	mins
religion.in.group	−1.078***	−1.106***	−0.520	0.061
	(0.394)	(0.397)	(0.617)	(1.635)
I(100 ∗norm.pctle)	−0.048***	−0.049***	−0.039***	−0.005
	(0.007)	(0.007)	(0.011)	(0.028)
time_rank	0.150***	0.147***	0.147***	0.168
	(0.013)	(0.013)	(0.034)	(0.225)
Constant	27.864***	28.015***	27.484***	27.718***
	(0.545)	(0.550)	(0.830)	(2.090)
Observations	7,866	7,758	3,512	542
R^2	0.023	0.023	0.010	0.001
Adjusted R^2	0.023	0.023	0.009	−0.004
Note:				*p<0.1; **p<0.05; ***p<0.01

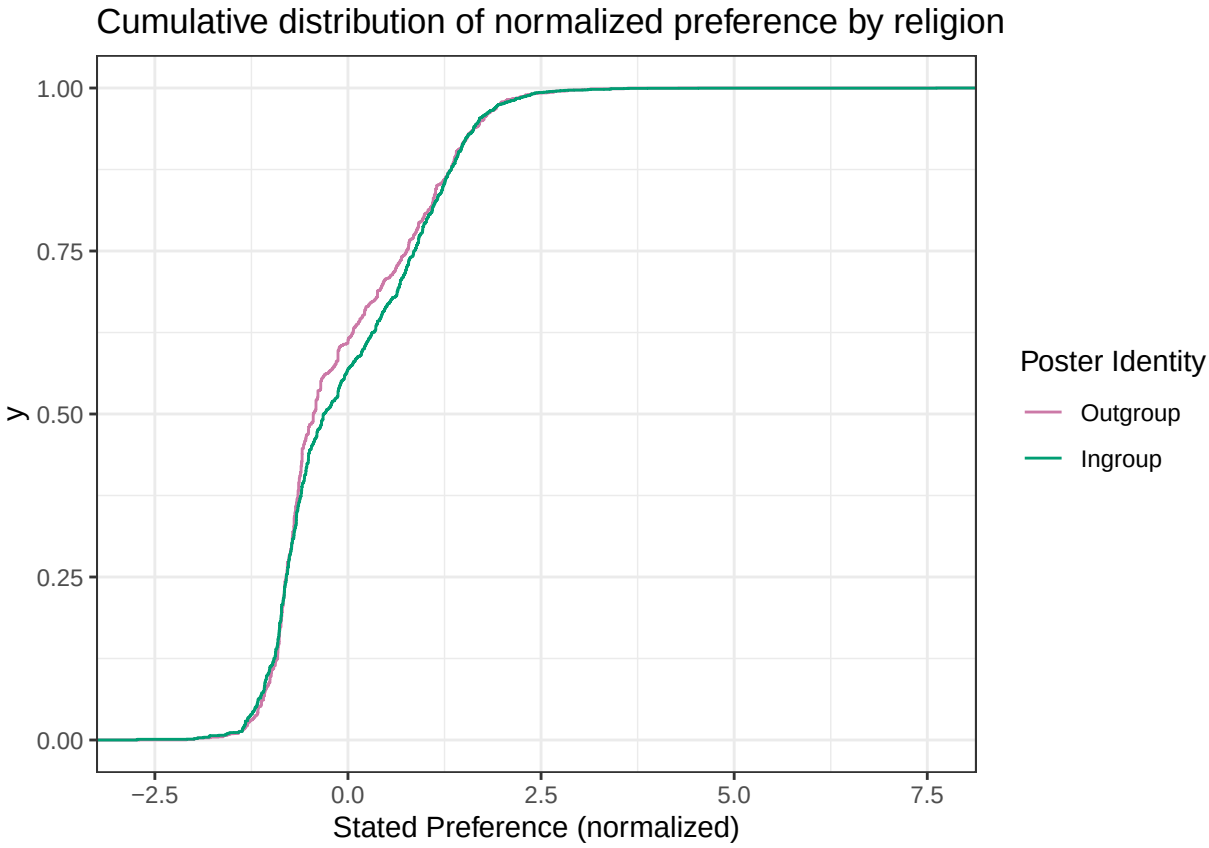
Table 8: Time Results - Top 10

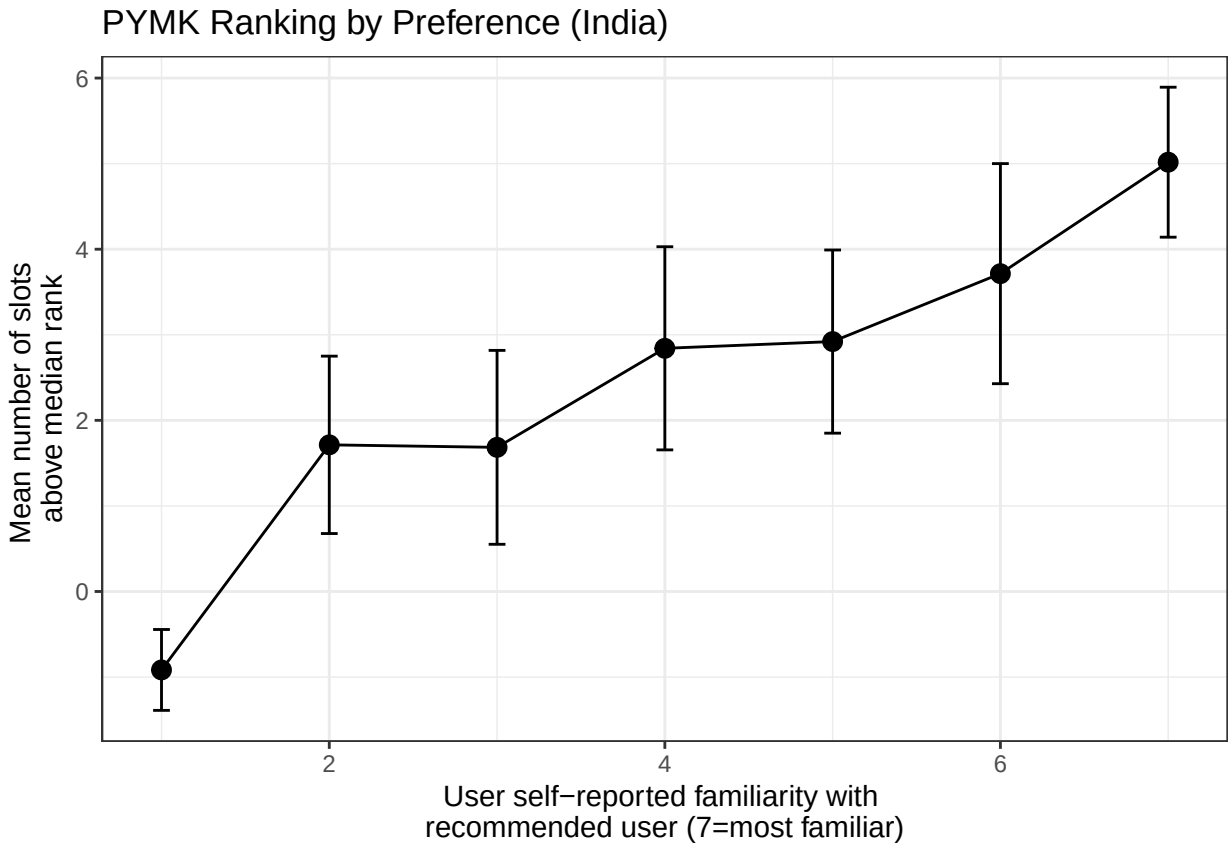
	Dependent variable:			
	nf.order			
	(1)	(2)	(3)	(4)
	all	recent10	recent20	recent30
religion.in.group	−1.078***	−1.476*	−0.605	−0.615
	(0.394)	(0.847)	(0.598)	(0.491)
I(100 ∗norm.pctle)	−0.048***	−0.047***	−0.043***	−0.044***
	(0.007)	(0.014)	(0.010)	(0.008)
time_rank	0.150***	0.096	0.176***	0.187***
	(0.013)	(0.144)	(0.051)	(0.028)
Constant	27.864***	27.974***	26.779***	26.796***
	(0.545)	(1.246)	(0.863)	(0.704)
Observations	7,866	1,922	3,721	5,317
R^2	0.023	0.008	0.008	0.014
Adjusted R^2	0.023	0.006	0.008	0.014
Note:				*p<0.1; **p<0.05; ***p<0.01

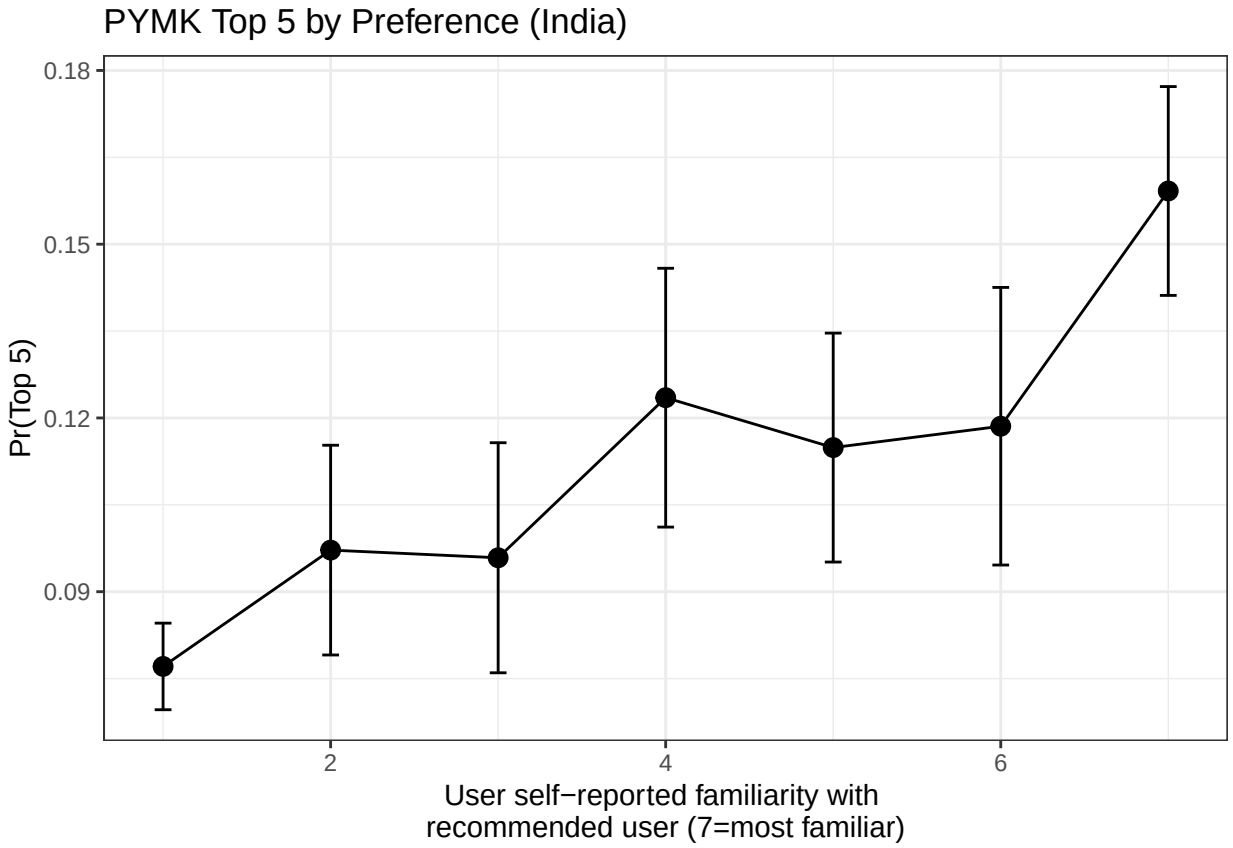


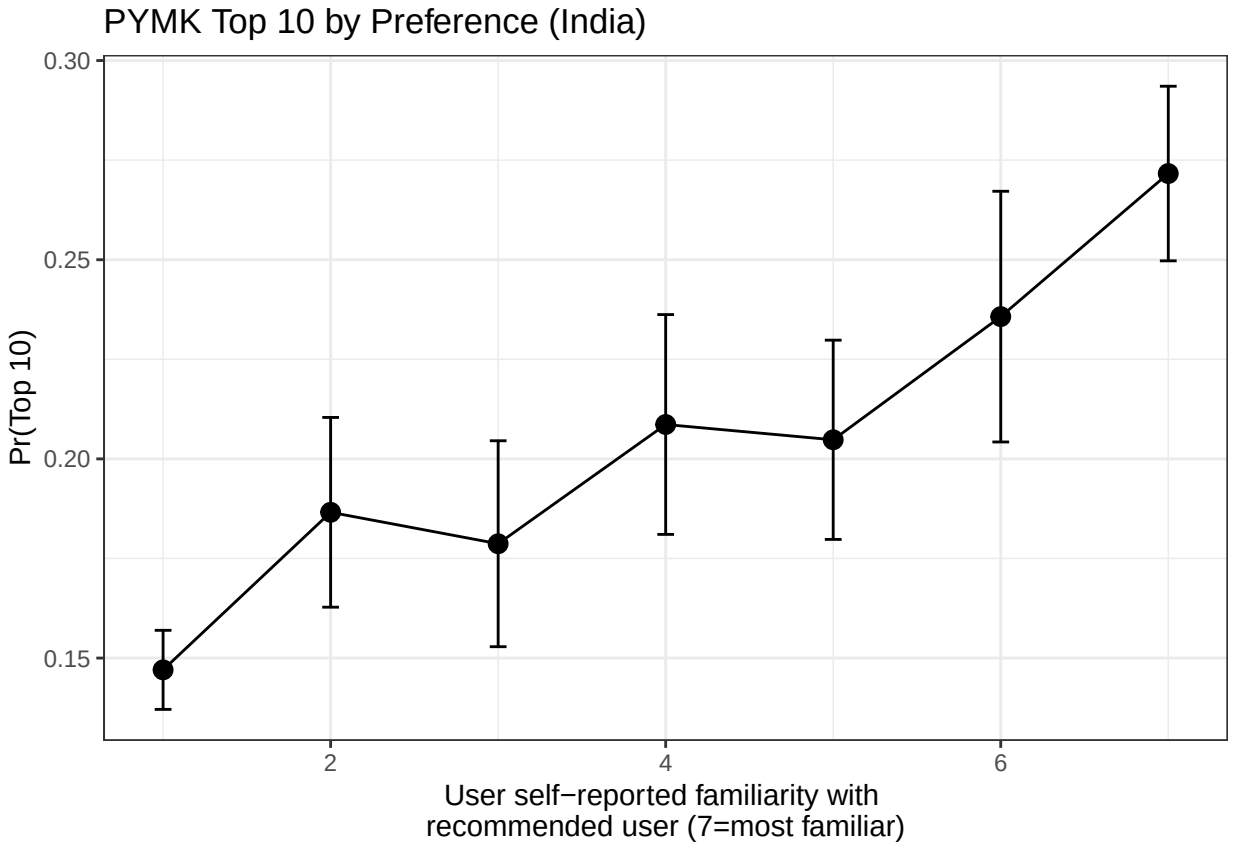

Raw Reported Preference by Race Group
Same−religion posts are slightly more preferred
Mean Rating
0
1
2
3
FALSE
TRUE
religion.in.group

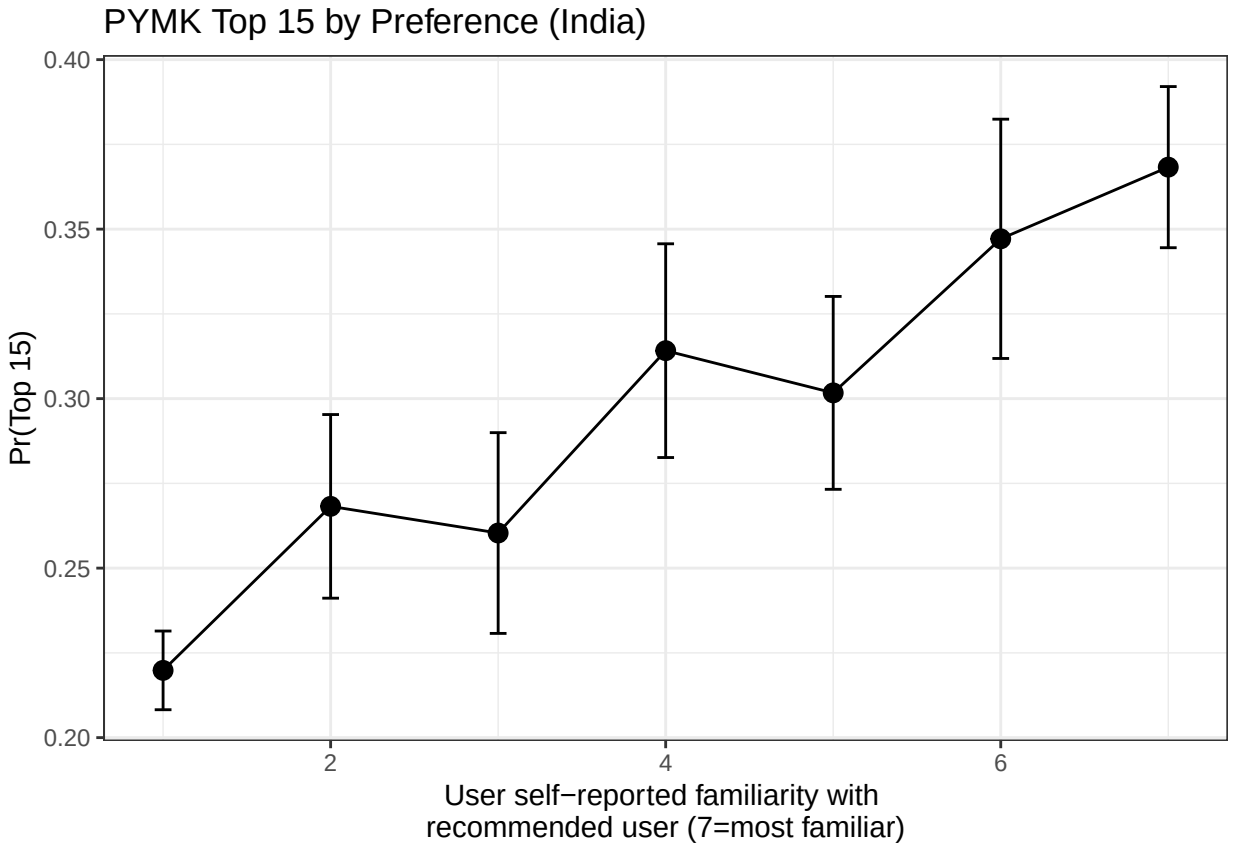

Distribution of normalized preference by religion
density
0.0
0.2
0.4
0.6
−2.5
0.0
2.5
5.0
7.5
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup

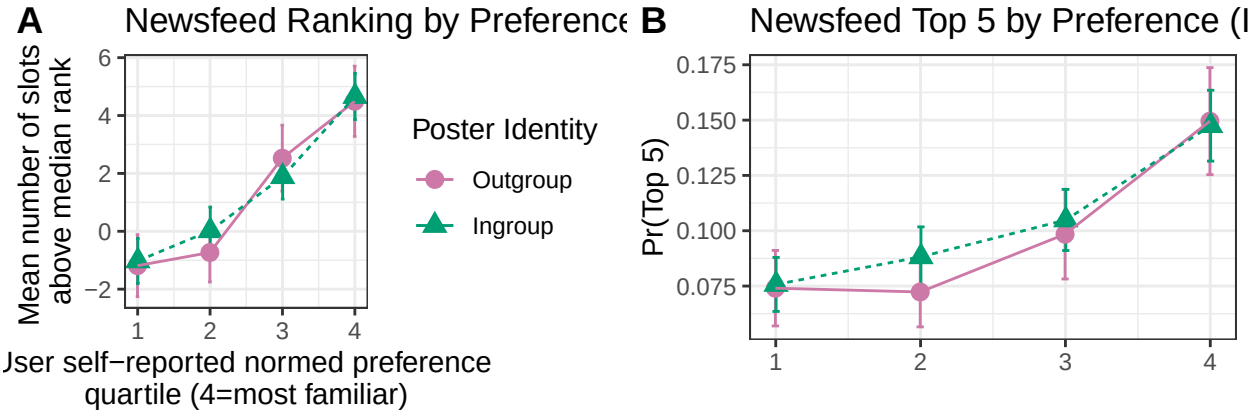

Cumulative distribution of normalized preference by religion
1.00
0.75
0.50
0.25
0.00
y
−2.5
0.0
2.5
5.0
7.5
Stated Preference (normalized)
Poster Identity
Outgroup
Ingroup

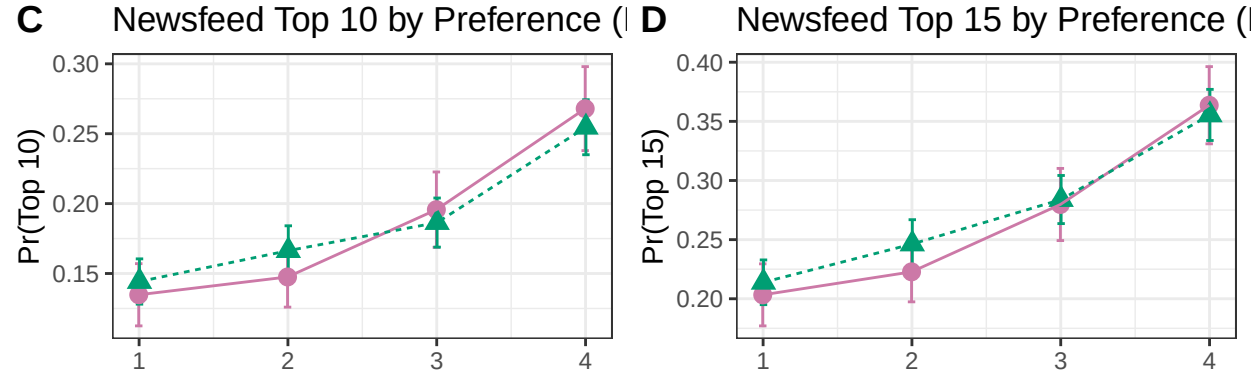

PYMK Ranking by Preference (India)
6
4
2
0
Mean number of slots above median rank
2
4
6
User self−reported familiarity with recommended user (7=most familiar)

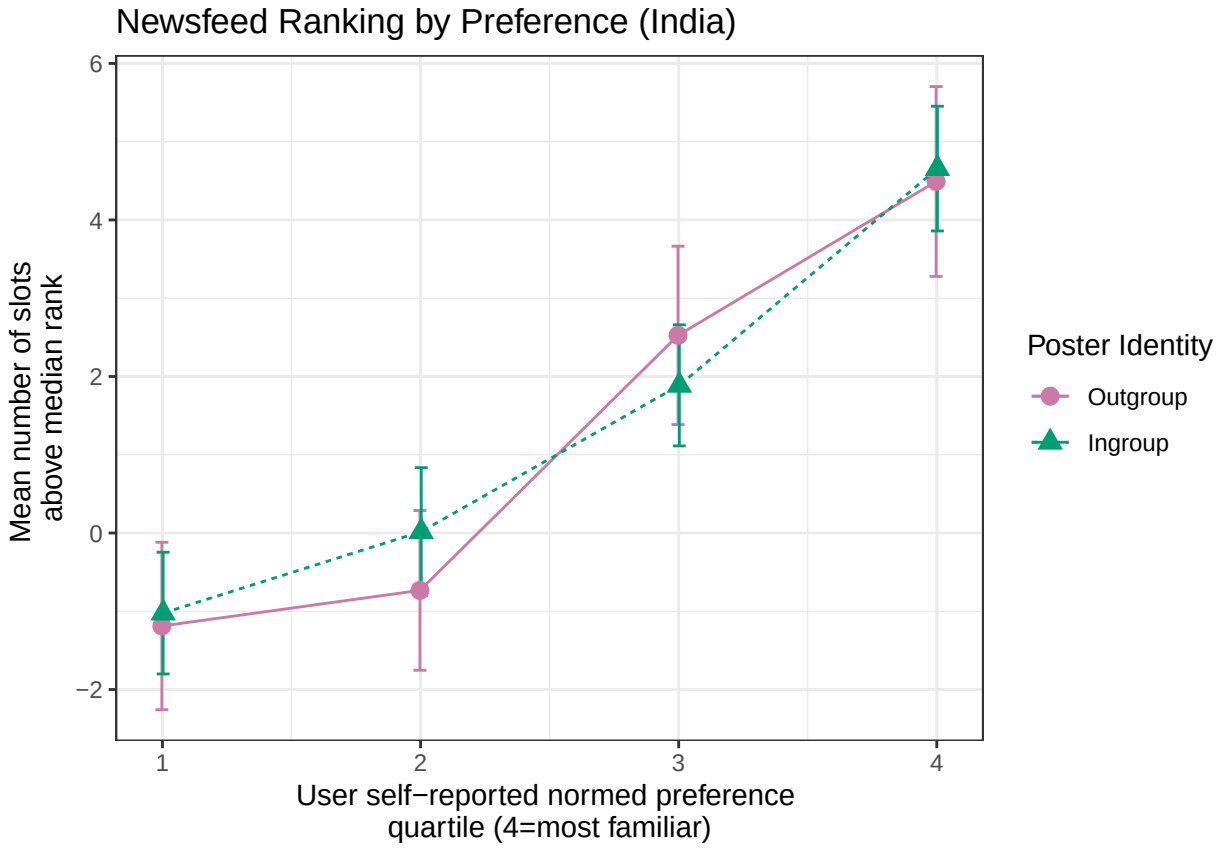

PYMK Top 5 by Preference (India)
0.18
0.15
0.12
0.09
Pr(Top 5)
2
4
6
User self−reported familiarity with
recommended user (7=most familiar)


PYMK Top 10 by Preference (India)
0.30
0.25
0.20
0.15
Pr(Top 10)
2
4
6
User self−reported familiarity with
recommended user (7=most familiar)

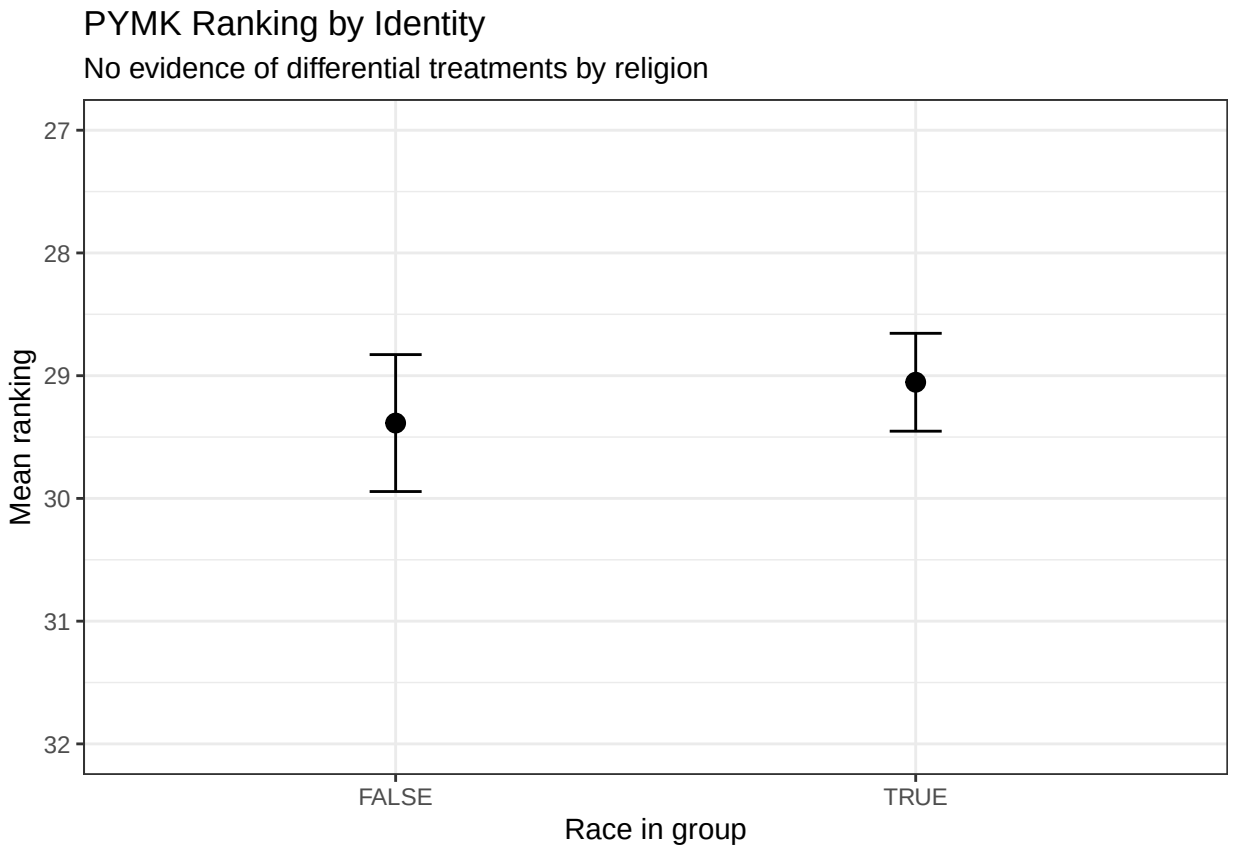

PYMK Top 15 by Preference (India)
Pr(Top 15)
0.40
0.35
0.30
0.25
0.20
2
4
6
User self−reported familiarity with
recommended user (7=most familiar)

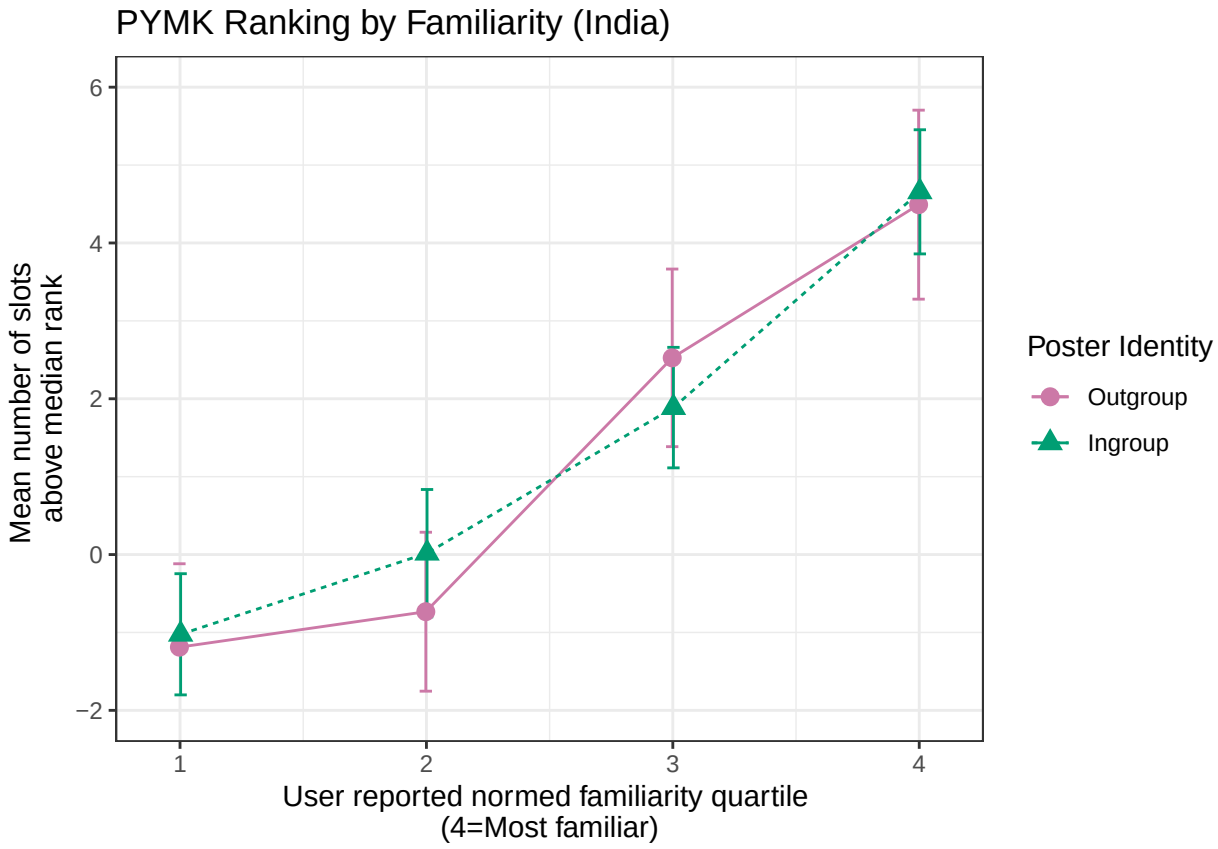

A
Newsfeed Ranking by Preferenc
Mean number of slots
above median rank
6
4
2
0
−2
1
2
3
4
Poster Identity
Outgroup
Ingroup
Jser self−reported normed preference
quartile (4=most familiar)
B
Newsfeed Top 5 by Preference (I
Pr(Top 5)
0.175
0.150
0.125
0.100
0.075
1
2
3
4

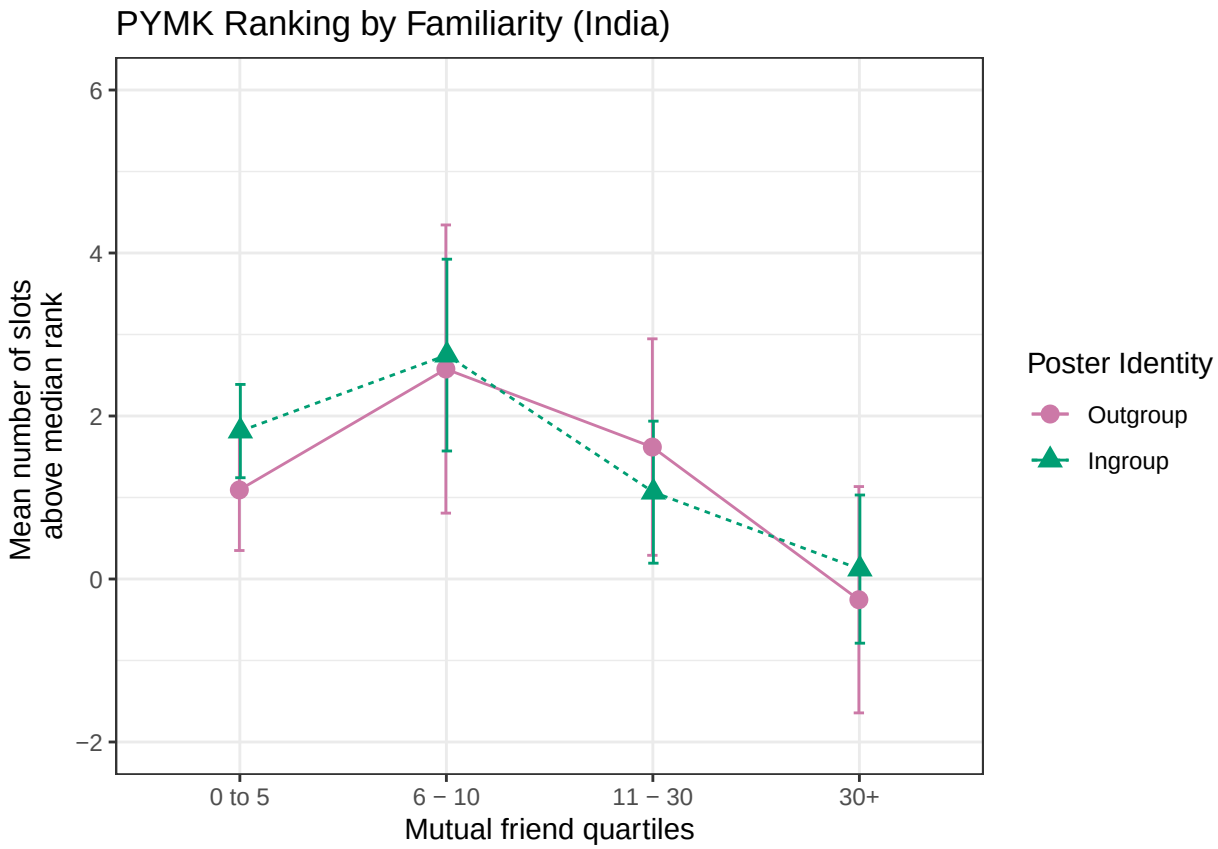

C
Newsfeed Top 10 by Preference (
Pr(Top 10)
0.30
0.25
0.20
0.15
1
2
3
4
D
Newsfeed Top 15 by Preference (
Pr(Top 15)
0.40
0.35
0.30
0.25
0.20
1
2
3
4

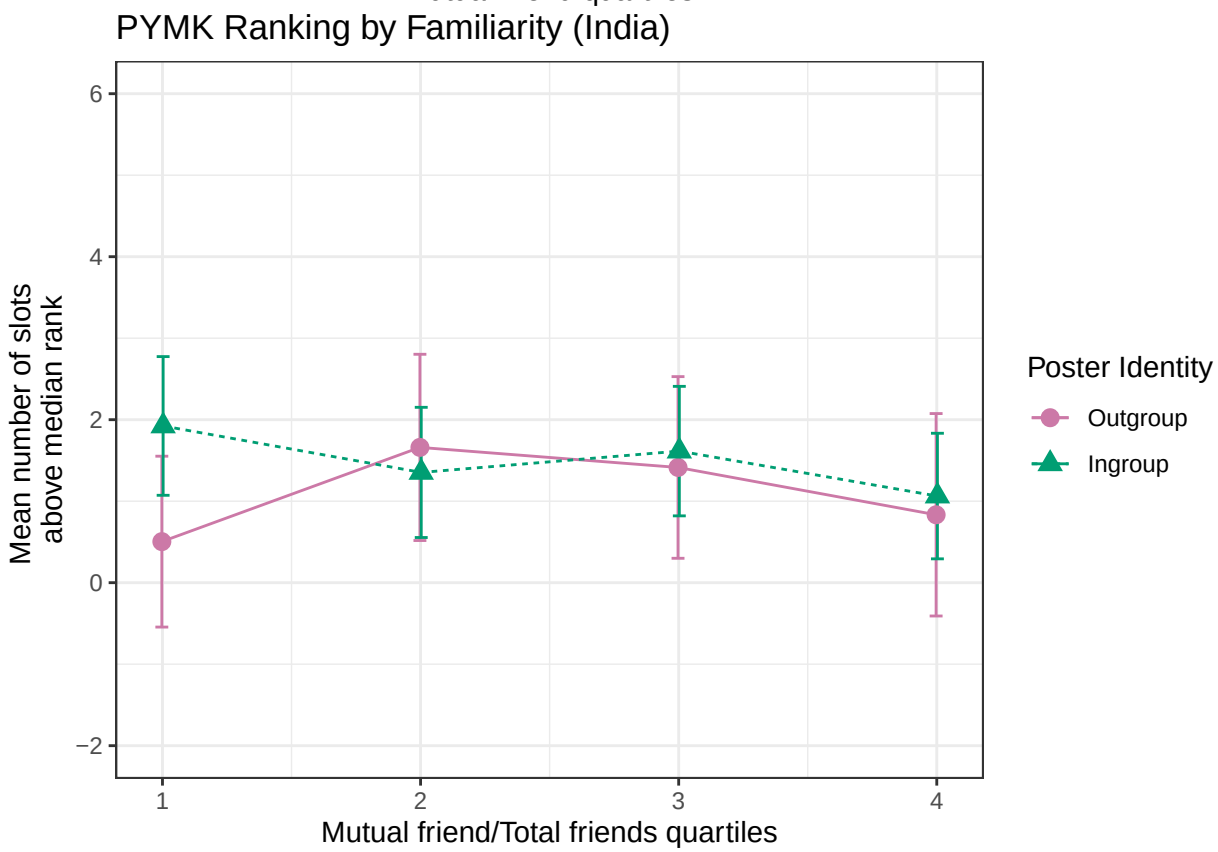



```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```

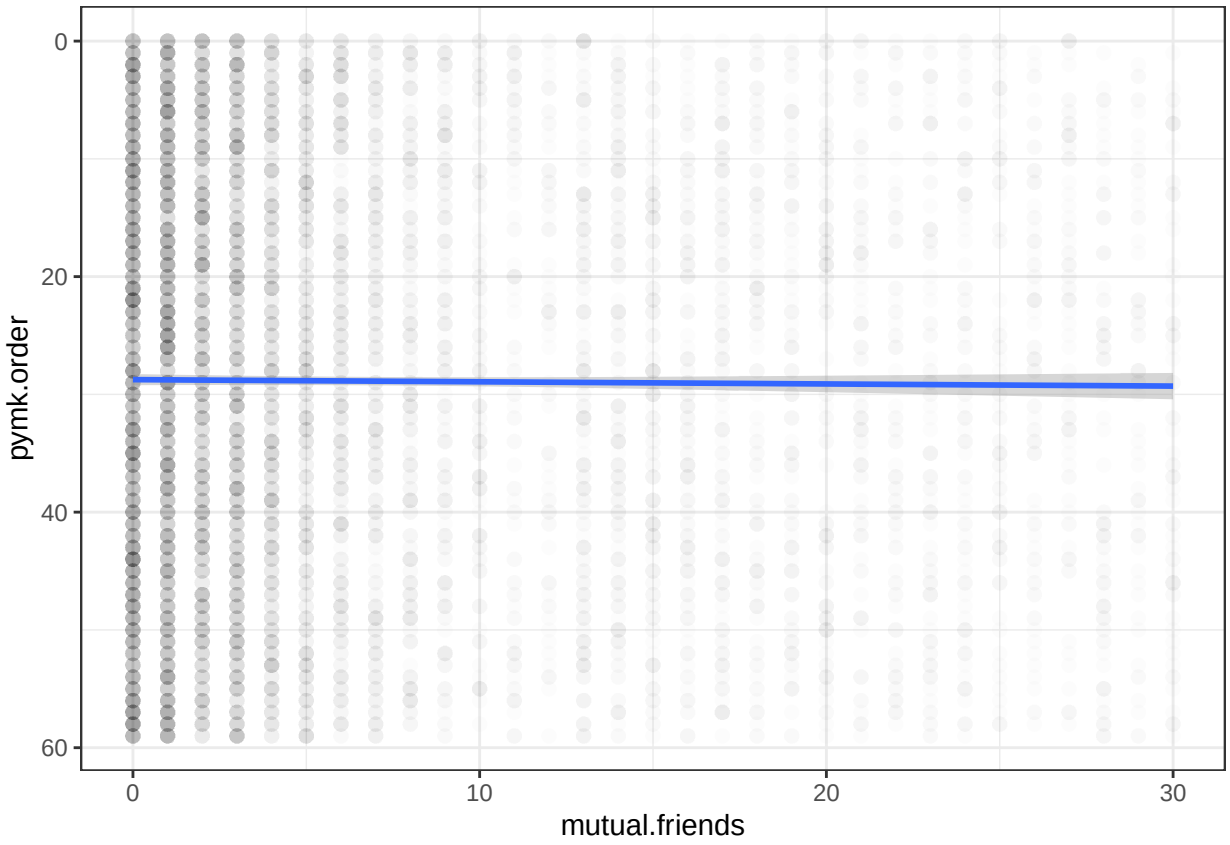

PYMK Ranking by Identity
No evidence of differential treatments by religion
Mean ranking
27
28
29
30
31
32
FALSE
TRUE
Race in group

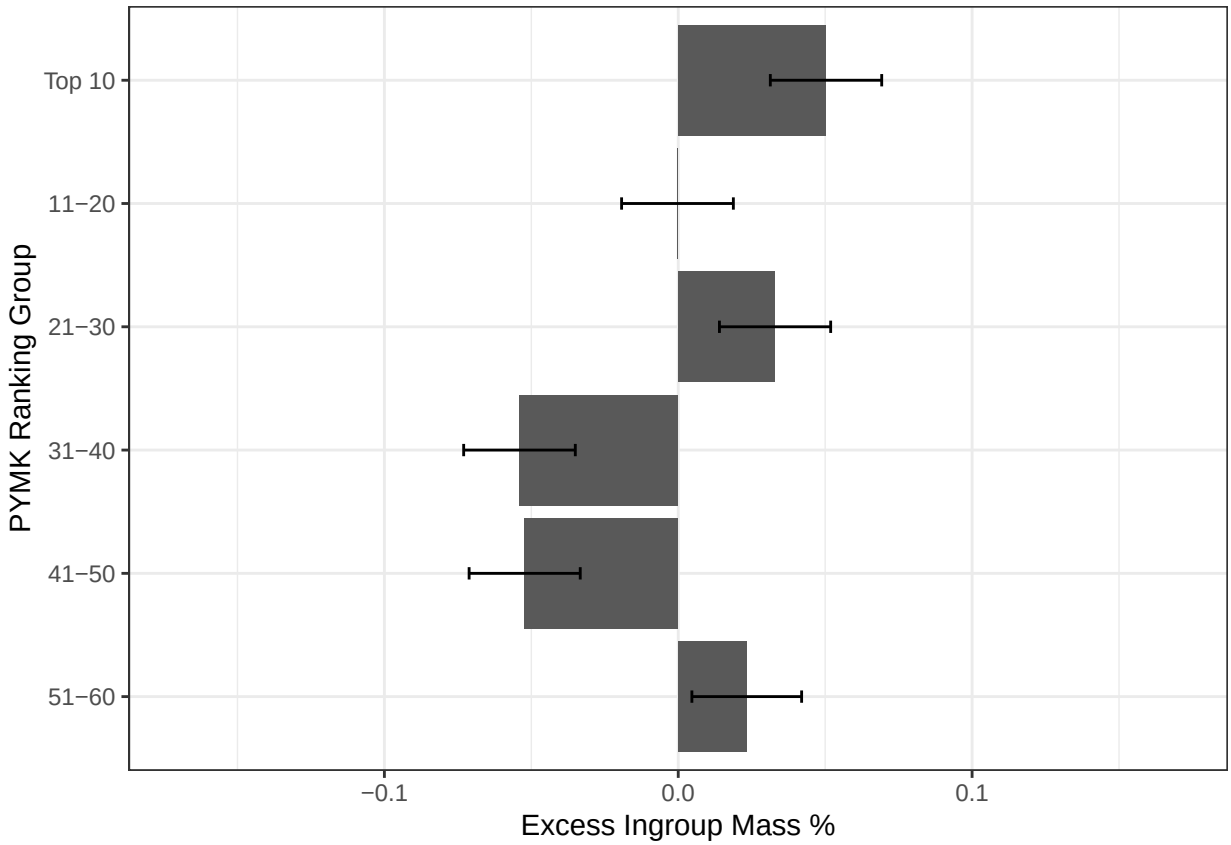

PYMK Ranking by Familiarity (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
User reported normed familiarity quartile
(4=Most familiar)
Poster Identity
Outgroup
Ingroup


PYMK Ranking by Familiarity (India)
Mean number of slots above median rank
6
4
2
0
−2
0 to 5
6 − 10
11 − 30
30+
Mutual friend quartiles
Poster Identity
Outgroup
Ingroup


PYMK Ranking by Familiarity (India)
Mean number of slots above median rank
6
4
2
0
−2
1
2
3
4
Mutual friend/Total friends quartiles
Poster Identity
Outgroup
Ingroup

```
## `geom_smooth()` using formula 'y ~ x'
```





Regression Tables

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:05:41

% Table created by stargazer v.5.2.2 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu
% Date and time: Tue, Feb 02, 2021 - 16:05:42

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% Date and time: Tue, Feb 02, 2021 - 16:05:42

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% Date and time: Tue, Feb 02, 2021 - 16:05:42

Table 9: Primary NF Rank Results

	Dependent variable:			
	nf.order			
	(1)	(2)	(3)	(4)
	all.mdl	hindu.mdl	muslim.mdl	other.mdl
religion.in.group	1.126***	1.492***	0.958	2.420
	(0.397)	(0.538)	(0.692)	(2.156)
I(100 ∗norm.pctle)	0.047***	0.046***	0.043***	0.107***
	(0.007)	(0.009)	(0.012)	(0.033)
Constant	−31.340***	−31.614***	−30.949***	−34.107***
	(0.457)	(0.627)	(0.745)	(2.003)
Observations	7,866	4,912	2,521	319
R^2	0.007	0.007	0.006	0.036
Adjusted R^2	0.007	0.007	0.005	0.030
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 10: Primary NF Top 10 Results

	Dependent variable:			
	top10			
	(1)	(2)	(3)	(4)
	all.mdl	hindu.mdl	muslim.mdl	other.mdl
I(100 ∗norm.pctle)	0.001***	0.001***	0.001***	0.002***
	(0.0002)	(0.0002)	(0.0003)	(0.001)
religion.in.group	0.005	0.002	0.015	0.060
	(0.009)	(0.012)	(0.015)	(0.049)
Constant	0.134***	0.136***	0.138***	0.076*
	(0.010)	(0.014)	(0.017)	(0.046)
Observations	7,866	4,912	2,521	319
R^2	0.004	0.004	0.004	0.030
Adjusted R^2	0.004	0.003	0.003	0.023
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 11: Primary PYMK Rank Results

	Dependent variable:			
	pymk.order			
	(1)	(2)	(3)	(4)
	all.mdl	hindu.mdl	muslim.mdl	other.mdl
religion.in.group	0.186	0.200	0.561	−2.191
	(0.349)	(0.540)	(0.584)	(2.241)
I(100 ∗norm.pctle)	0.080***	0.077***	0.089***	0.041
	(0.006)	(0.007)	(0.010)	(0.028)
Constant	−33.272***	−33.282***	−33.639***	−31.209***
	(0.398)	(0.592)	(0.647)	(1.639)
Observations	10,882	6,833	3,449	480
R^2	0.018	0.017	0.022	0.007
Adjusted R^2	0.018	0.017	0.021	0.003
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 12: Primary PYMK Top 10 Results

	Dependent variable:			
	top10			
	(1)	(2)	(3)	(4)
	all.mdl	hindu.mdl	muslim.mdl	other.mdl
I(100 ∗norm.pctle)	0.002***	0.001***	0.002***	0.001
	(0.0001)	(0.0002)	(0.0002)	(0.001)
religion.in.group	0.003	0.015	−0.007	−0.027
	(0.008)	(0.012)	(0.013)	(0.050)
Constant	0.107***	0.100***	0.103***	0.139***
	(0.009)	(0.013)	(0.015)	(0.037)
Observations	10,882	6,833	3,449	480
R^2	0.013	0.012	0.017	0.006
Adjusted R^2	0.013	0.012	0.016	0.002
Note:				*p<0.1; **p<0.05; ***p<0.01