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Relations Between Alphabetized Name Order and Nomination Counts in Peer Nomination Measures

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Abstract

Peer nominations, a central method for measuring peer relationships in developmental research, typically involve asking children or adolescents to choose peers who fit various criteria from an alphabetized roster of classmates or grade-mates. Although such measures have been used for decades, very little research has investigated the effects of alphabetical name order on the number of nominations received by peers. The current study collected peer nominations for 20 items among 607 eighth grade participants in two schools. Regression analyses showed that earlier name order significantly predicted higher nomination counts for eight of the items, and explained over 5% of the variance in four affective variables (friendship, acceptance, acquaintanceship, and received liking). Across variables, name order effects were negatively correlated with internal reliability of nominations, implying that order effects may be related to the consensus of the peer group. Name order also had a minimal effect on intercorrelations among a subset of variables. Implications and concrete recommendations for controlling and reducing name order effects in future research are discussed.

Keywords: peer nominations, sociometric methods, order effects, peer acceptance

Relations between Alphabetized Name Order and Nomination Counts in Peer Nomination Measures

In developmental and educational research, peer nominations are a central method to investigate social behavior, and (along with other sociometric measures) are commonly used to measure peer relationships. The typical procedure for peer nominations, in which participants receive a roster of classmates or grade-mates and are asked to identify which peers fit particular social or behavioral criteria, has been used for nearly a century (see, e.g., Bronfenbrenner, 1943). However, certain aspects of the methodology of peer nominations remain understudied; for example, only one study has systematically investigated the effects of the order in which names are listed on the roster presented to participants. Poulin and Dishion (2008) collected peer nominations for participants using alphabetized rosters of same-grade peers in three schools (*N*s ranged from 190 to 274), and then correlated received nomination counts with each participant's ordinal position on the roster. Results showed that higher positions on the list were associated with more nominations received for five of the six unlimited-nomination variables.

The lack of research on the effects of name order on peer nominations is surprising, considering the well-known effects that order of presentation can have throughout psychological measurement (e.g., fatigue effects, motivation effects in low-stakes measurement). The implications of name order effects for peer nominations are potentially troubling. It is possible that sociometric researchers have been introducing systematic bias into peer nominations, and that this bias has been inflating the associations between variables. If two peer nomination variables are positively correlated, to what extent is this correlation due to the fact that participants with earlier listed names were more likely to be nominated for both variables?

The first goal of the current investigation was to replicate Poulin and Dishion's (2008)

findings. As in that study, we analyzed data from peer nominations in large samples (>270 students at each of two schools) that involved alphabetized, same-grade rosters, to determine whether earlier-listed participants received more nominations.

Although Poulin and Dishion (2008) showed that name order effects were statistically significant, it is difficult to tell how meaningful the effects of name order might be. Thus, the second (and primary) goal of this investigation was to quantify the magnitude of name order effects on peer nominations. This was accomplished in two ways. First, we determined the R^2 values for the effects of name order on the number of nominations received for each variable. Second, we investigated the effects of name order on correlations between a predetermined set of the most commonly used variables in sociometric research (friendship, acceptance, rejection, popularity, overt aggression, relational aggression, and prosocial behavior).

The final goal of this study was to see whether name order more strongly affected variables that were less internally reliable. Marks, Babcock, Cillessen, and Crick (2013), and Babcock, Marks, Crick, and Cillessen (2014) have argued that internal reliability of a peer nomination item indicates the extent to which nominators agree upon which peers fit the item (see also Perry, Kusel, & Perry, 1988). Correspondingly, these researchers found that popularity and overt behaviors (for which consensus would be expected) were more reliable than affective and relational measures such as acceptance, rejection, and friendship (for which we would not necessarily expect agreement). If participants do not have a clear idea of whom to nominate for a given criterion, we would expect name order to have a greater effect on nominations. In this case, we expected a negative association between the internal reliability of an item and the effects of name order on nominations derived from that item.

Method

Participants

Participants were 607 8th grade students in a medium-sized town in New England who were engaged in a larger longitudinal study of peer relationships. The sample was about half female (49.1%) and primarily Caucasian (68.9%), African-American (17.6%), and Hispanic/Latino (11.5%). Participants were drawn from two middle schools (*N*s = 273 and 334) with comparable demographic characteristics. Completion rates for peer nomination measures were above 90% in both schools (*N* of nominators = 251 and 303, respectively).

Measures

Participants completed peer nomination items. For each item, participants were provided with a roster of same-grade peers of both sexes, listed in alphabetical order by first name, and were asked to circle the names of all peers who fit the item description. Twenty items were presented to participants in an invariant order (see Table 1), including *friendship* (best friends), *acceptance* (like most), *rejection* (like least), *acquaintanceship* (hang around with), *received liking* (like you most), *received disliking* (like you least), *overt aggression* (start fights, pick on, tease), *relational aggression* (2 items; e.g., ignore others or spread rumors), *has delinquent friends* (hang around kids who get in trouble), *overt victimization* (2 items; e.g., get pushed and kicked by others), *relational victimization* (2 items; e.g., has lies, rumors, and mean things said about them), *prosocial behavior* (2 items; e.g., share and help others), *withdrawal* (stay by themselves), *received attention* (who others pay attention to), *popularity* (most popular), and *unpopularity* (least popular).

Data Preparation

A participant's score for each item was based on the number of received nominations for that item. Each participant was assigned a name order value based on his or her ordinal position

on the roster, such that the first participant listed had a name order value of 1.

Internal reliability of each item was determined using KR-20, a commonly used index of lower-bound reliability for dichotomous exam questions. It is conceptually similar to Cronbach's α (Cronbach, 1951), specialized to dichotomous data. For this study, nominations were converted into a 0/1 response matrix with nominators in the columns and nominees in the rows. A nominee received a value of 1 (keyed) every time a particular nominee selected him or her (0 otherwise). Thus, from a measurement perspective, nominators were treated as items and nominees were treated as participants, and the reliability indicates the general consensus among nominators regarding which peers fit a given criterion.[1] Nominators always had a planned missing value for nominating themselves. The KR-20 values were averaged across the two schools for each variable to create a single value and are shown in Table 1. The correlation between schools of the KR-20 values across the 20 items was .94.

Results

The first goal of this study was to determine whether peer nominations were affected by name order. Regression analysis was conducted for each of the 20 peer nomination variables, with nomination scores serving as the criterion variable. Each analysis included two steps, with school (dummy-coded as 0 or 1) as a control predictor in Step 1 and name order added as a predictor in Step 2. Table 1 shows the results (ΔR^2 and β values) for Step 2; the effects of school were included as a control and were not relevant to the current analyses. Because standard multiple regression analysis assumes that predictors are parametric but the name order variable was ordinal, statistical significance levels for R^2 and β were based on the *L*-statistic (Thomas, Nelson, & Thomas, 1999). The *L*-statistic is compared to χ^2 probability values to determine

[1] See Marks et al. (2013) and Babcock et al. (2014) for complete conceptual discussions of using internal reliability to assess consensus of peer nominations.

significance, and was more appropriate and conservative than typical *F*-tests and *t*-tests used to determine significance in regressions.

As Table 1 shows, nomination counts for 8 of the 20 variables were significantly associated with name order in Step 2 of the regressions. In all cases, earlier name order predicted a larger number of nominations received.[2]

Looking at the R^2 values for the regressions in Table 1, it is clear that the effects of name order on nomination counts were strongest for affective variables such friendship, acceptance, acquaintanceship, and received liking. Name order accounted for over 5% of the variance in each of these variables. In general, however, the effects of name order were small. Across items, the average variance accounted for by name order was 1.7%.

Beyond investigating the direct effects of name order on individual variables, we also investigated the effects of name order on the associations between variables. Table 2 presents Spearman's rho correlations between friendship, acceptance, rejection, popularity, overt aggression, relational aggression (the mean of the two relational aggression items), and prosocial behavior (the mean of the two prosocial items). Below the diagonal are partial correlations controlling for school only. Above the diagonal are partial correlations controlling for school and name order. Comparing correlation coefficients above and below the diagonal, we see that controlling for name order reduced the magnitude of several bivariate correlations, but only to a minor extent; the largest difference between coefficients was .05.[3]

Finally, in order to test whether less reliable variables were more susceptible to the

[2] Curvilinear effects of name order were also examined by including squared name order as a predictor in a third step of the regressions. The squared term resulted in a statistically significant change in R^2 for only one out of twenty variables (Prosocial Behavior 2; $\Delta R^2 = .01$, $p < .05$). Given the low ΔR^2 and the fact that the Type I error rate in this study is 1/20, this significant result seems likely enough to be a statistical artifact that we excludedthe result.

[3] Spearman's rho partial correlations were used in the current study because the name order variable is ordinal. For comparison, standard Pearson partial correlations were also conducted; the pattern of results was very similar and the largest difference between matched coefficients above and below the diagonal was .04.

influence of name order effects, we correlated KR-20 internal reliability values with the ΔR^2 due to name order in each regression. As expected, higher internal reliability was strongly associated with lower effects of name order across the 20 variables ($r = -.54$, $p = .014$).

Discussion

Previous research by Poulin and Dishion (2008) established that the order of participants' names on rosters could be significantly related to peer nomination scores, such that earlier-listed nominees received more nominations. The goals of this study were (1) to replicate Poulin and Dishion's findings that name order is related to nomination counts, (2) to measure the magnitude of the effect on nomination counts and on the interrelations between variables, and (3) to test the hypothesis that name order would more strongly affect variables with lower internal reliability.

Significant effects of name order were found for 8 of the 20 sociometric variables in this study, such that earlier names were more likely to be chosen for those variables. Affective and relational variables were most strongly affected by name order, which accounted for at least 5% of the variance in friendship, acceptance, acquaintanceship, and received liking. Other items (rejection, received attention, and both relational aggression items) showed lower, but still significant, name order effects.

Although order effects may impact any type of psychometric measurement, the use of alphabetized rosters has been standard practice in sociometric research because they make data collection easy for participants. A handful of researchers have attempted to eliminate these effects by randomizing name orders when collecting data in fairly small classrooms (e.g., van den Berg & Cillessen, 2013); however, random name orders may be more onerous for participants. Ultimately, easier nominations mean more nominations and less fatigue, which should theoretically increase both the reliability and validity of sociometric choices (see Marks et

al., 2013). If name order effects are introducing measurable amounts of systematic error into nomination counts, however, the use of alphabetized rosters will directly decrease validity. When determining whether to utilize alphabetical rosters in future nomination research, investigators may need to consider the balance between logistical factors and validity. Although it could be argued that 1-2% error is minimal, it is difficult to make the case that higher levels of systematic error is acceptable, particularly when comparing multiple nomination variables to each other. Although name order did not significantly affect bivariate correlations between variables in this study, controlling for name order reduced the magnitude of these correlations by up to .05 (see Table 2); in some cases, inflating a correlation by that amount would increase the possibility of a Type I error (as in the correlation between acceptance and rejection in the current study).

Additionally, large name order effects may directly impact measures of the reliability of peer nomination variables. Whether measuring internal reliability of individual items (Marks et al., 2013), the correlations between multiple items for the same construct (Babcock et al., 2014), or stability/test-retest reliability of peer nominations (Jiang & Cillessen, 2005), any effect of name order will inflate the apparent amount of systematic variance in the data.

We hypothesized that less internally reliable variables, particularly affective and relational variables (Babcock et al., 2014; Marks et al., 2013), would be more affected by name order. This hypothesis was supported, indicating that the effect of name order is especially powerful when there is less a consensus in the peer group regarding which peers fit a given criterion. This finding may indirectly support Poulin and Dishion's (2008) supposition that participants respond to different nomination items in different ways. For some items, participants respond by scanning the roster, name-by-name, to determine whether each peer fits the item description (the "scanning" strategy). For other items, participants immediately think of

particular peers, and then identify them on the roster (the "selecting" strategy). Name order would affect nominations more when participants use the "scanning" strategy than when they use the "selecting" strategy (Poulin & Dishion, 2008). It is also reasonable to suppose that internal reliability might be lower for variables for which the "scanning" strategy is used, since participants are not choosing peers who immediately stand out for the item.

Limitations

A key limitation of this study was the fact that the order of items presented to participants was invariant. The nomination items that were first presented (e.g., friendship and acceptance) were among the least reliable and the most affected by name order. Although we expected that affective items such as friendship and acceptance would be most impacted by name order because there is less peer group consensus regarding them, item order was somewhat confounded with internal reliability and may also have interacted with the relation between reliability and name order in some way that we did not measure in the current study. Given that this study used an invariant item order, there is no way to fully disentangle item type (i.e., affective vs. behavioral) with item order. As such, conclusions regarding the association between internal reliability and effects of name order should be interpreted with caution, and future research on name order should vary the order of item presentation to avoid (or investigate) this issue.

More broadly, it should be noted that certain variations of peer nomination procedures may be less subject to name order effects. The current study required participants to select names from relatively large rosters of participants. Studies that include smaller rosters may make it easier for participants to scan names without privileging the top names on a list, and may not be subject to name order effects. Name order effects should also be completely irrelevant in nomination procedures that do not involve rosters. Farmer, Hall, Petrin, Hamm, and Dadisman

(2010), for example, required participants to name peers based on free recall partly to avoid the possibility of order effects.

Conclusions

Based on the current results (and acknowledging that future research is needed), we conclude that the effects of name order on peer nominations are negligible for some variables. Although 40% of the variables were affected by name order to a statistically significant extent, some of these significant effects explained only 1-2% of the variance. This amount of systematic error might be considered acceptable when weighed against the convenience of using alphabetical rosters, especially when the reference group is large.

For a handful of variables, on the other hand, name order had a notable effect on nomination counts, accounting for up to 7% of the variance in some of the affective/relational variables. Despite the fact that name order did not substantially affect intercorrelations between variables, the percentage of variance explained is too high to ignore.

How can we deal with name order effects in the future? On a methodological level, we would like to echo Poulin and Dishion's (2008) recommendation that participants be instructed to carefully consider peers *before* they mark any names on a roster. As Poulin and Dishion also suggested, order effects may also be reduced by counterbalancing names on rosters.

From a statistical perspective, the most direct way to mitigate the effects of name order is to statistically control for it in analyses (making sure to account its nonparametric nature). Researchers can partial out the effects of name order in correlations or include name order as a control variable in more complex analyses.

In addition to controlling for name order, future researchers should also analyze and report the effects of name order on nomination counts. Reporting name order effects will provide

researchers with a basis to compare the effects across different types of samples (particularly different grade/classroom sizes and different age groups), variables, and methodological configurations. This will provide researchers with a basis to study and make recommendations regarding “best practices” in peer nomination research.

References

Babcock, B., Marks, P. E. L., Crick, N. R., & Cillessen, A. H. N. (2014). Limited nomination reliability using single- and multiple-item measures. *Social Development, 23*, 518-536. doi: 10.1111/sode.12056

Bronfenbrenner, U. (1943). A constant frame of reference for sociometric research. *Sociometry, 6*, 363-397. doi: 10.2307/2785218

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334. doi: 10.1007/BF02310555

Farmer, T. W., Hall, C. M., Petrin, R., Hamm, J. V., & Dadisman, K. (2010). Evaluating the impact of a multicomponent intervention model on teachers' awareness of social networks at the beginning of middle school in rural communities. *School Psychology Quarterly, 25*, 94-406. doi: 10.1037/a0020147

Kuder, G. F., & Richardson, M. W. (1937). The theory of the estimation of test reliability. *Psychometrika, 2*, 151–160.

Jiang, X. L., & Cillessen, A. H. N. (2005). Stability of continuous measures of sociometric status: A meta-analysis. *Developmental Review, 25*, 1-25. doi: 10.1016/j.dr.2004.08.008

Marks, P. E. L., Babcock, B., Cillessen, A. H. N., & Crick, N. R. (2013). The effects of participation rate on the internal reliability of peer nomination measures. *Social Development, 22*, 609-622. doi: 10.1111/j.1467-9507.2012.00661.x

Perry, D. G., Kusel, S. J., & Perry, L. C. (1988). Victims of peer aggression. *Developmental Psychology, 24*, 807-814. doi: 10.1037/0012-1649.24.6.807

Poulin, F., & Dishion, T. J. (2008). Methodological issues in the use of peer sociometric nominations with middle school youth. *Social Development,* 17, 908-921. doi:

10.1111/j.1467-9507.2008.00473.x

Thomas, J. R., Nelson, J. K., & Thomas, K. T. (1999). A generalized rank-order method for nonparametric analysis of data from exercise science: A tutorial. *Research Quarterly for Exercise and Sport, 70*, 11023. doi: 10.1080/02701367.1999.10607726

van den Berg, Y. H. M., & Cillessen, A. H. N. (2013). Computerized sociometric and peer assessment: An empirical and practical evaluation. *International Journal of Behavioral Development, 37*, 68-76. doi: 10.1177/0165025412463508

Table 1

Predicting Sociometric Nomination Counts from Alphabetized Name Order

		Regression Step 2[a]	
	(KR-20)	ΔR^2	Name Order β
Friendship	(.76)	.07***	−.26***
Acceptance	(.89)	.05***	−.23***
Rejection	(.88)	.03***	−.17***
Received Attention	(.94)	.02**	−.13**
Overt Aggression	(.94)	.01	-.07
Withdrawal	(.95)	.00	.02
Relational Victimization 1	(.84)	.00	−.04
Overt Victimization 1	(.96)	.00	−.00
Received Liking	(.79)	.05***	−.22***
Received Disliking	(.76)	.01	−.07
Relational Aggression 1	(.83)	.00	−.06
Relational Aggression 2	(.86)	.01	−.10
Acquaintanceship	(.85)	.06***	−.25***
Has Delinquent Friends	(.91)	.00	−.06
Popularity	(.98)	.01	−.09
Unpopularity	(.95)	.00	−.04
Prosocial Behavior 1	(.89)	.01*	−.12*
Relational Victimization 2	(.92)	.00	.02
Overt Victimization 2	(.95)	.00	.03
Prosocial Behavior 2	(.87)	.03***	−.17***

Note. Items are listed in order of presentation to nominators. Significance levels are based on comparing the *L*-statistic to chi-square probability values (Thomas et al., 1999).

[a] Step 1 included only school (dummy-coded as 0 or 1) as a predictor; the effect of school is not noted in the table.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2

Spearman Partial Correlations between Sociometric Variables, With (Above Diagonal) and Without (Below Diagonal) Name Order

	Friendship	Acceptance	Rejection	Popularity	Overt Aggression	Relational Aggression	Prosocial Behavior
Friendship		.87***	.03	.66***	.18***	.44***	.64***
Acceptance	.88***		.05	.78***	.22***	.48***	.69***
Rejection	.08	.10*		.21***	.54***	.60***	−.02
Popularity	.66***	.78***	.23***		.36***	.59***	.52***
Overt Aggression	.19***	.23***	.55***	.36***		.64***	−.13***
Relational Aggression	.45***	.49***	.61***	.60***	.64***		.24***
Prosocial Behavior	.65***	.71***	.02	.52***	−.11***	.26***	

Note. Spearman rho partial correlations below the diagonal controlled for school (dummy-coded as 0 or 1) only. Spearman rho partial correlations above the diagonal controlled for school and name order. Relational Aggression and Prosocial Behavior were calculated by finding the means of two items each.
* $p < .05$. ** $p < .01$. *** $p < .001$.