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The Role of Friendship Reciprocity in University Freshmen's Alcohol Consumption

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Background: The similarity of friends in the frequency and quantity of alcohol consumption is explored. **Method:** During their first semester, 57 psychology freshmen indicated weekly drinking frequency and quantity and nominated the three peers of this group they liked most. These nominations were then used to derive the weekly alcohol consumption of friends that either did or did not reciprocate a nomination. **Results:** Multilevel modeling of weekly variations showed that individuals' drinking frequency was similar to peers who reciprocated a friendship (b = 0.15, p = .001), but not to non-reciprocating peers (b = −0.01, p = .720). In contrast, weekly variation in quantity of individual students' drinking was similar to both reciprocating (b = 0.11, p = .018) and non-reciprocating peers' drinking (b = 0.10, p = .014). Yet across all weeks, quantity tended only to be similar to non-reciprocating peers (b = 0.49, p = .020). **Conclusions:** Freshmen might spend drinking time with peers who reciprocate a friendship, but are similar regarding the quantity of drinks consumed to all people they find interesting. Thus, alcohol consumption is used strategically for social purposes. This social purpose should also be acknowledged in alcohol-reduction interventions.

Keywords: alcohol consumption, college freshmen, friendship reciprocity, social drinking, social influence, social network

INTRODUCTION

The first year of university, during which adolescents find themselves in a new social setting and independent from their parents, is a crucial setting for young adults to establish a way of dealing with alcohol (Borsari, Murphy, & Barnett, 2007). Peers might play an important role in this process as university freshmen seek social acceptance and to establish a social identity (Borsari & Carey, 2001; Borsari et al., 2007). This is reflected by the fact that young adults' alcohol use is similar to that of friends and close peers (Andrews, Tildesley, Hops, & Li,

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2002; Barnett et al., 2013; Lau, Quadrel, & Hartman, 1990; Reifman, Watson, & McCourt, 2006). There are indications that this similarity is dependent on characteristics of the friendship, such as its reciprocation (i.e. whether a nomination of someone as a friend is returned by this individual; Brechwald & Prinstein, 2011; Marschall-Lévesque, Castellanos-Ryan, Vitaro, & Séguin, 2014).

In this vein, cross-sectional research with adolescents has shown that reciprocating friends show more similar drinking behavior as reciprocating friendships might be well established and quite stable (Bot, Engels, Knibbe, & Meeus, 2005; Burk, van der Vorst, Kerr, & Stattin, 2012). Furthermore, in order to become acquainted, adolescents might strategically adjust their alcohol consumption over time to that of people they want to befriend but who have not yet reciprocated this feeling (see Bot et al., 2005; Jaccard, Blanton, & Dodge, 2005; but also Burk et al., 2012). In this context, Bot and colleagues (2005) suggested that the frequency of alcohol consumption might have different social purposes from the quantity consumed. Specifically, they theorised that adolescents might assimilate drinking frequency to keep reciprocating friends but adjust the quantity to acquire new friends. For instance, if a student has a friend, it is likely that there will be occasions where she or he drinks alcohol together with that person. These shared occasions might be seen as important to maintain the current relationship status. On the other hand, drinking the same amount of drinks at those events might not be a precondition to maintain the friendship. Yet, having a similar drinking quantity at a certain event might be perceived as a means to befriend people one finds interesting such as people that were nominated as friends, but have not yet reciprocated the friendship (Bot et al., 2005). This strategy might be based on the idea that people feel more sympathy for others that mimic their behaviors in a direct interaction (Chartrand & Lakin, 2013). Both mechanisms and their differentiation have yet to be investigated empirically among university freshmen, a group that is particularly strongly affected by peer processes (Borsari & Carey, 2001; Borsari et al., 2007).

Therefore, the current study explores the role of friendship reciprocity in shaping both frequency (number of drinking days) and quantity (number of drinks per day) of alcohol consumption in this setting. Specifically, we examined whether drinking frequency is especially similar to reciprocating friends and drinking quantity to non-reciprocating friends. Weekly assessments of an emerging freshmen network were conducted to capture the dynamics of alcohol consumption in a new and evolving social setting. As extraversion, agreeableness, and conscientiousness are shown to be related to drinking quantity (Malouff, Thorsteinsson, Rooke, & Schutte, 2007) as well as to social bonding generally (Selfhout et al., 2010), these traits were controlled for. Furthermore, mere social status effects were ruled out by regarding the popularity (outdegree; i.e. the number of liking nominations received) and social activity of an individual (indegree; i.e. the number of liking nominations given to other people).

METHOD

Participants and Procedure

Eighty-nine first semester psychology students enrolled at the University of Konstanz in the fall of 2008 were informed about the study in an introductory psychology course in the first week and invited to the study via e-mail. The information included a description of the general set-up of the study as well as the content; for example, that the study would be assessing social ties and alcohol consumption behavior. In total, 78 of these students agreed to participate by responding to the e-mail. They were asked to complete a personalised online survey each week of the first semester (mid-October–mid-February), except for a three-week break over Christmas, rendering a total of 16 assessments. At each time point they were asked about their alcohol consumption in that week and to select the three classmates they liked most. At baseline, participants also indicated their gender, age, and personality traits. In the end, 57 participants completed six or more of the 16 time points and were included in the analyses (75.44% female; Age: $M = 20.92$; $SD = 3.20$; Range = 18–34). Six time points were selected as the minimum by determining the inflexion point of a number of participant losses to the number of completed time points to achieve a good signal-noise ratio. Twelve participants agreeing to participate dropped out at baseline after providing gender information, another five did not provide any information on alcohol consumption at baseline including one participant of the final sample, and two of the final sample did not provide age information. Drop-out analyses indicated that regularly participating students were similar to drop-outs with regard to age ($t(62) = 0.13$, $p = .894$, $d = 0.05$), drinking behaviors at the first time point (all $t(59) \leq 1.18$, all $p \geq .240$, all $d \leq .551$), extraversion and agreeableness (all $t(64) \leq 1.38$, all $p \geq .182$, all $d \leq .494$). Regular participants were, however, more conscientious ($M = 3.14$; $SD = 0.64$) compared to drop-outs ($M = 2.56$, $SD = 0.58$, $t(64) = 0.13$, $p = .012$, $d = 0.925$). In addition, there was a trend for females to be less likely to drop out ($\chi^2(1, N = 78) = 3.228$, $p_{\text{Fisher}} = .070$). The final dataset consisted of 802 out of 912 possible observations, of which two were excluded due to outlying data values (20 drinks, 8 more than the next value) and the rest due to missing reports of alcohol consumption for a specific time point. Control analyses including the outliers showed only minor changes in results (for number of drinks, extraversion was not significant ($b = 0.34$, $p = .184$) and general behavior of non-reciprocated peer was just a trend ($b = 0.42$, $p = .054$)).

The study complied with University of Konstanz's ethical standards. This study was conducted in the framework of a greater research project (SozNet) for

which other networks of university freshmen were assessed in other years (Hartung & Renner, 2013; Hartung, Sproesser, & Renner, 2015).

Measures

Alcohol Consumption. Alcohol consumption was assessed via a quantity and frequency approach (e.g. Arterberry, Smith, Martens, Cadigan, & Murphy, 2013; Marlatt et al., 1998). For frequency, participants were asked whether they had consumed alcohol in the past week. If they said yes, they were asked to note the number of days in the past week they had consumed alcohol ("On how many days in the past week did you drink alcohol?"). For quantity, participants were asked to indicate the number of drinks they consumed on average on each of these drinking days ("How many alcoholic drinks did you have on average on each of these days?"). In addition, an indication of German standard drink sizes was included (see Demmel, 2005). This information was used to derive the number of days of alcohol consumption per week, referred to from now on as *drinking days* (M = 1.4; SD_{within} = .99; $SD_{between}$ = .94; ICC = .48), and the average of number of alcoholic drinks per drinking day, referred to from now on as *average number of drinks* (M = 1.9; SD_{within} = 1.57; $SD_{between}$ = 1.40; ICC = .44), for each week of the study.

Friendships and Social Degree. To evaluate friendships, all participants were given a list of names of all other participants and asked to nominate the three people they liked most that week (see also Brandes, Indlekofer, & Mader, 2012; Hartung & Renner, 2013). For each participant and at every time point, two social degree measures were computed from these nominations (see also Wasserman & Faust, 1994): outdegree (M = 2.82; SD_{within} = 0.44; $SD_{between}$ = 0.48; ICC = .55, potential Range = 0–3), and indegree (M = 2.2; SD_{within} = 1.12; $SD_{between}$ = 1.20; ICC = .53, potential Range = 0–77). As the outdegree is defined by the number of nominations actively given and the indegree is defined by the nominations of the whole group, there were no missing values on either variable for all participants who were participating at a given time point. We refer to the peers who are nominated as most liked by an individual as that individual's friends. Furthermore, these individuals' friends were coded as reciprocating if they also nominated that individual, and as non-reciprocating if they did not nominate that individual.

Friends' Alcohol Consumption. To measure alcohol consumption of reciprocating friends, an average of all available behavior of reciprocating friends was computed for both drinking days (M = 1.4; SD_{within} = 0.97; $SD_{between}$ = 0.61; ICC = .28) and number of drinks (M = 1.9; SD_{within} = 1.56; $SD_{between}$ = 1.15; ICC = .35). Alcohol consumption of all non-reciprocating friends was computed by taking the average of all available behavior of non-reciprocating friends for

both drinking days (M = 1.6; SD_{within} = 1.07; $SD_{between}$ = 0.61; ICC = .24) and number of drinks (M = 2.1; SD_{within} = 1.87; $SD_{between}$ = 0.70; ICC = .12). All empty cells were recoded to the mean level of reciprocating and non-reciprocating friends' behavior, respectively (see also Ripley, Snijders, Boda, Vörös, & Preciado, 2014).

Personality Traits. To control for personality trait effects, the Big 5 subscales extraversion, conscientiousness, and agreeableness were assessed via a validated German short form consisting of the average of two items per trait (Rammstedt & John, 2007) on a 5-point scale (extraversion: M = 2.89, SD = 0.79; conscientiousness: M = 3.14, SD = 0.64; agreeableness: M = 2.94, SD = 0.57).

Statistical Analysis

Multilevel regression modeling was used to predict both the number of drinking days and the average number of drinks per drinking day. Models were constructed in SPSS 22 with restricted maximum likelihood estimates to test the effects of the respective behavior of reciprocating and non-reciprocating friends. The models predicted differences in drinking behavior between individuals across the semester by extraversion, conscientiousness, agreeableness, gender, and the average of indegree, outdegree, reciprocating, and non-reciprocating friends' drinking across all time points, respectively (all grand-mean centered). Furthermore, to predict weekly variation of drinking behavior within an individual, a linear time trend and weekly variations from the individual mean in indegree, outdegree, reciprocating, and non-reciprocating friends' drinking (all person-mean centered; Enders & Tofighi, 2007) were included. In addition, the models accounted for random intercept and linear time effects, their correlation, and autocorrelations in the residual variance (see Table 1 for all effects modeled). The inclusion of random slopes for all other within effects led to non-convergence and was therefore not further considered (see also Hox, 2010). To test whether there is a difference between the effect of reciprocating and non-reciprocating friends' behavior, the same analyses were repeated with a different coding scheme: the behavior of reciprocating friends was contrasted to the sum of the behavior of both reciprocating and non-reciprocating friends instead of using non-reciprocating friends. This direct test of difference in regression weights is reported in addition to the two regression weights of reciprocating and non-reciprocating friends.

RESULTS

The dynamics of friendships and drinking behavior is displayed in an animation (Supplementary 1; see also Brandes et al., 2012).

TABLE 1
Multilevel Regression Model of Alcohol Consumption for Drinking Days and Average Number of Drinks

	Drinking days per week							*Average number of drinks*						
					95% CI							*95% CI*		
Fixed effects	*Estimate*	(SE)	t	p[a]	*Lower*	*Upper*	*PRV*[b]	*Estimate*	(SE)	t	p[a]	*Lower*	*Upper*	*PRV*[b]
Intercept	1.36	0.10	13.47	<.001	1.16	1.56		1.87	0.17	11.06	<.001	1.53	2.21	
Level 2 (between-person)														
Gender	0.77	0.26	3.01	0.004	0.26	1.29		0.91	0.43	2.11	0.041	0.04	1.77	
Extraversion	0.36	0.15	2.38	0.021	0.06	0.67		0.41	0.24	1.70	0.095	−0.07	0.90	
Conscientiousness	−0.14	0.16	−0.87	0.386	−0.47	0.19		−0.67	0.26	−2.52	0.015	−1.20	−0.13	
Agreeableness	0.15	0.19	0.78	0.442	−0.24	0.53		0.35	0.32	1.07	0.289	−0.30	1.00	
Outdegree	0.50	0.23	2.17	0.035	0.04	0.96		0.61	0.38	1.61	0.115	−0.15	1.37	
Indegree	−0.13	0.09	−1.39	0.171	−0.32	0.06		−0.05	0.16	−0.35	0.730	−0.37	0.26	
Reciprocating friends' behavior	0.15	0.18	0.84	0.408	−0.21	0.50	0.005	−0.05	0.16	−0.30	0.763	−0.38	0.28	n.d.
Non-reciprocating friends' behavior	0.10	0.15	0.66	0.511	−0.20	0.39	n.d.	0.49	0.20	2.40	0.020	0.08	0.90	0.058
Level 1 (within-person)														
Time (in weeks)	−0.05	0.01	−5.76	<.001	−0.07	−0.03		−0.03	0.01	−2.88	0.006	−0.05	−0.01	
Outdegree	−0.14	0.08	−1.80	0.079	−0.30	0.01		−0.14	0.13	−1.05	0.300	−0.40	0.12	
Indegree	0.06	0.03	1.99	0.052	0.00	0.12		0.04	0.05	0.80	0.425	−0.06	0.14	
Reciprocating friends' behavior	0.15	0.04	3.54	0.001	0.07	0.23	0.018	0.11	0.04	2.45	0.018	0.02	0.19	0.003
Non-reciprocating friends' behavior	−0.01	0.04	−0.36	0.720	−0.10	0.07	n.d.	0.10	0.04	2.55	0.014	0.02	0.17	0.012

Table 1 *(Continued)*

	Drinking days per week							*Average number of drinks*						
					95% CI							*95% CI*		
Random effects	*Estimate*	(SE)	t	p[a]	*Lower*	*Upper*	*PRV*[b]	*Estimate*	(SE)	t	p[a]	*Lower*	*Upper*	*PRV*[b]
Level 2 (between-person)														
Intercept	0.51	0.12	4.26	<.001	0.32	0.80		1.43	0.33	4.36	<.001	0.91	2.25	
Time with Intercept	−0.01	0.01	−1.70	0.088	−0.03	0.00		0.02	0.02	1.07	0.283	−0.01	0.05	
Time	0.00	0.00	2.56	0.011	0.00	0.00		0.00	0.00	1.15	0.251	0.00	0.01	
Level 1 (within-person)														
Residual	0.78	0.05	17.04	<.001	0.70	0.87		2.35	0.13	18.07	<.001	2.11	2.62	
Autocorrelation	0.12	0.05	2.53	0.012	0.03	0.20		0.01	0.04	0.22	0.825	−0.08	0.10	
Pseudo-R^{2c}	0.627							0.527						
Pseudo-ΔR^{2c}	0.008							0.012						

Notes: [a]*p*-values are two-tailed except for variance components. The degrees of freedom are adjusted to the number of subjects and not to observations (see also Bolger & Laurenceau, 2013). [b]PRV is the proportional reduction of within-person or between-person variance considering the respective effect (see also Peugh, 2010); negative values were deemed as non-defined (n.d.) [c]Similarly, pseudo-R^2 and pseudo-ΔR^2 are computed from the correlation of predicted values with the actual ones (see also Peugh, 2010). Both can be seen as a measure of effect sizes, but need to be interpreted with caution. The difference in pseudo-ΔR^2 refers to the model with and without both reciprocating and non-reciprocating ties.

Effects of Friends' Drinking Days on Individuals' Drinking Days

Considering general differences between participants, a gender effect showed that males on average drank on 0.77 (p = .004, 95% CI [0.26, 1.29]) more days each week than females (see Table 1). More extraverted people (b = 0.36, p = .021, 95% CI [0.06, 0.67]) and people with a higher general outdegree (b = 0.50, p = .035, 95% CI [0.04, 0.96]) were drinking on more days. No other between-effects approached significance. In addition, there was no significant difference between the between-effects of reciprocating and non-reciprocating friends' behavior (b = 0.05, p = .856, 95% CI [−0.50, 0.60]).

In the weekly within-person variation, drinking days were similar to drinking days of reciprocating (b = 0.15, p = .001, 95% CI [0.07, 0.23], PRV = 0.018), but not of non-reciprocating friends (b = −0.01, p = .720, 95% CI [−0.10, 0.07], PRV = n.d.). As such, the difference between these two effects was significant (b = 0.16, p = .004, 95% CI [0.05, 0.28]). Moreover, across time drinking frequency decreased each week on average by 0.05 drinking days per week (p < .001, 95% CI [−0.07, −0.03]). In addition, there was a trend of a relationship to the degrees: the higher the indegree (b = 0.06, p = .052, 95% CI [0.00, 0.12]) and the lower the outdegree (b = −0.14, p = .079, 95% CI [−0.30, 0.01]), the more drinking days reported for the previous week.

Effects of Friends' Average Number of Drinks on Individuals' Number of Drinks

Considering general differences between participants, males consumed on average 0.91 more drinks per drinking day than females (p = .041, 95% CI [0.04, 1.77]). More conscientious people consumed a lower number of drinks (b = −0.67, p = .015, 95% CI [−1.20, −0.13]) and there was a trend for the more extraverted to consume more drinks (b = 0.41, p = .095, 95% CI [−0.07, 0.90]). Moreover, the average number of drinks of non-reciprocating friends was related to the average number of own drinks (b = 0.49, p = .020, 95% CI [0.08, 0.90], PRV = 0.058), whereas the drinks of reciprocating friends showed no relationship (b = −0.05, p = .763, 95% CI [−0.38, 0.28], PRV = n.d.). However, tests of the difference between the two only showed a marginal trend (b = −0.54, p = .079, 95% CI [−1.14, 0.06]). No other personality or between-effect approached significance (see Table 1).

In the weekly within-person variations, the average number of drinks was similar to that of nominated friends, regardless of whether this nomination was reciprocated (reciprocating: b = .11, p = .018, 95% CI [0.02, 0.19], PRV = 0.003; non-reciprocating: b = .10, p = .014, 95% CI [0.02, 0.17], PRV = 0.012). Illustrating that both effects were similar, the difference between the effects of reciprocating and non-reciprocating friends was insignificant (b = 0.01, p = .897,

95% CI [−0.11, 0.12]). Furthermore, across time drinking quantity decreased each week on average by 0.03 drinks per drinking day (p = .006, 95% CI [−0.05, −0.01]). Within-person variations in in- and outdegree were not related to the number of drinks the previous week (indegree: b = 0.04, p = .425, 95% CI [−0.06, 0.14]; outdegree: b = −0.14, p = .300, 95% CI [−0.40, 0.12]).

DISCUSSION

This study showed that university freshmen's weekly alcohol consumption is similar to that of the peers they like (see also Andrews et al., 2002; Barnett et al., 2013; Lau et al., 1990; Reifman et al., 2006). Specifically, friendship reciprocity has differential effects on the similarity of alcohol consumption frequency and quantity.

For drinking days (frequency), an association between individual behavior and friends' behavior was observed only in reciprocating friendships within a week. This might indicate that university freshmen go out more often with people to whom a mutual friendship has already been established—maybe as a joint activity. This perspective is supported by qualitative evidence from a study in which university students stated that they drank moderately with friends for events like a dinner or end-of-day drink or limited their drinking because of a partner (Colby, Colby, & Raymond, 2009). Furthermore, some indicated that they would continue drinking after university in order not to lose friends. Thus, students might expect that similarity in the frequency of alcohol consumption might help to maintain already established friendships (see also Bot et al., 2005).

Interestingly, the university freshmen's average number of drinks per drinking day within a week (quantity) was similar to that of people they liked, regardless of reciprocation. This is in accordance with the findings of Overbeek and colleagues (2011) in a bar-lab study: Friendship status did not affect drinking quantity above the effects of similarity to all peers present at the drinking location. Because similarity was found regardless of friendship reciprocation, the drinking behavior of all freshmen might have been affected by specific events in a given week shared by all individuals.

Yet, over the whole semester, drinking quantity tended to be more similar to non-reciprocating friends, while no effect could be found for reciprocating friends. In line with the findings of Bot and colleagues (2005), this can be seen as general adjustment processes of drinking quantity to people one likes, but who are not liking the individual back. One reason for this assimilation in drinking quantity might be the expectation of students that it will help to befriend others (Bot et al., 2005). This interpretation is also supported by the study of Colby and colleagues (2009), in which university students indicated that they picked up drinking behavior particularly to bond with peers and to overcome shyness. Alternative explanations such as the selection of people with similar

drinking behavior across the semester are less plausible, as this would yield a general effect of reciprocating, but not necessarily non-reciprocating, friends.

Taken together, this study provides first evidence that quantity and frequency of alcohol consumption might be similar in peers for different reasons: People might go out with friends to maintain their friendship status, while adjusting drinking quantity to people they would like to befriend. In order for this assimilation to take place, students should observe the alcohol consumption of their peers, so they can adjust to it, and may pay attention particularly to people they like, but who have not yet reciprocated liking nomination. Therefore, these principles of social modeling and learning are essential to explain the similarity found (e.g. Bandura, 1971).

Limitations

The interpretations are limited by the assumption that non-reciprocated friendships are themselves unstable and rather specifically indicate attempts to become befriended with another person (Bot et al., 2005; Wasserman & Faust, 1994). Alternatively, stable non-reciprocated friendships could be seen as a result of an unequal distribution of resources between two persons, as for instance high differences in social degree (Olk & Gibbons, 2010; Wasserman & Faust, 1994). Controlling for in- and outdegree as indicators of popularity (Wasserman & Faust, 1994), as was done in the current study, may be one way to rule out this alternative explanation. Yet, the effects of popularity on drinking by in- and outdegree remain somewhat inconclusive in this study.

Another potential limitation is the sole use of self-report that might be prone to social desirability (Davis, Thake, & Vilhena, 2010) and may not reflect what others perceive friends to do (e.g. Perkins & Craig, 2012). Yet, while it might be useful to also assess the effects of perception of drinking on an individual's own alcohol consumption, the applied approach facilitates the interpretation of effect as being social, because explanations of similarity due to projection of one's own behavior onto others (e.g. Prinstein & Wang, 2005) can easily be ruled out.

Finally, as this study only addressed one specific social network of university freshmen in a German university, the generalisability of the results should be corroborated further. On the one hand, similar associations of alcohol consumption with gender and personality traits as well as a general decline in drinking over time to meet academic requirements at the end of the first semester have been observed before (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Malouff et al., 2007). On the other hand, consumption was somewhat low compared to both national (Keller, Maddock, Laforge, Velicer, & Basler, 2007) or international student groups (Perkins & Craig, 2012), and alcohol consumption generally might have decreased since 2008 (Kraus, Pabst, Piontek, & de Matos, 2013). Furthermore, selection and assimilation processes might change once the network is well established in the second year of university (Ferrer, Dillard, &

Klein, 2012). Likewise, future studies could also address the role of romantic relationships and sex differences concerning the similarity. Generally, even if not necessarily generalisable, the presented example shows that drinking frequency and quantity serve different functions. This differentiation should be acknowledged in future studies. In addition, it would be interesting to use the approach presented here to assess similarity in even more detail to tap into specific social settings when these strategies might be at play.

CONCLUSIONS

All in all, the current study indicates that the frequency and quantity of alcohol consumption might serve different strategic purposes in the creation and maintenance of friendships among university freshmen. Future studies might separate this process in the dynamics of assimilation and selection to test whether similarity in frequency and quantity serve university freshmen in the creation and maintenance of friendships regardless of assimilation (for some ideas, see Cheadle, Stevens, Williams, & Goosby, 2013). Furthermore, the fact that alcohol consumption might be used strategically to serve a social function should also inform future interventions that try to decrease it. By acknowledging the social role of drinking on college life, social outcome expectancies should be taken into account to a greater extent (see also Niland, Lyons, Goodwin, & Hutton, 2013; de Visser, Wheeler, Abraham, & Smith, 2013).

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CONFLICT OF INTERESTS

We declare no conflict of interests.

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