Alcohol narrows physical distance between strangers

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Pandemic management is likely to represent a global reality for years to come, but the roadmap for how to approach pandemic restrictions is as yet unclear. Of the restrictions enacted during COVID-19, among the more controversial surround alcohol. Like many infectious diseases, the principal mode of transmission for COVID-19 is direct respiration of droplets emitted during close social contact, and health officials warn that alcohol consumption may lead to decreased adherence to physical distancing guidelines. Governing bodies have acted to close bars while restaurants and have also specifically restricted alcohol sales, while at the same time those in the nightlife industry have labeled these actions unfounded and discriminatory. Complicating such debates is the lack of evidence on alcohol’s effects on physical distance. In the current study we employed a randomized alcohol-administration design paired with computer-vision measures, analyzing over 20,000 proximity readings derived from video to examine the effect of alcohol consumption on physical distance during social interaction. Results indicated that alcohol caused individuals to draw significantly closer to an unfamiliar interaction partner during social exchange, reducing physical proximity at a rate with potentially important implications for public health. In contrast, alcohol had no effect on physical distance with a familiar interaction partner. Findings suggest that alcohol might act to overcome a natural caution people feel towards strangers and thus promote virus transmission between previously unconnected social groups.

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The authors declare no competing interest.

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consume alcohol, physical distance decreased significantly during the interaction (−0.29 cm/min; Table 1 and SI Appendix, Fig. S1). In contrast, among strangers assigned to consume a nonalcoholic beverage the reduction in distance was substantially smaller and nonsignificant (−0.06 cm/min). Of note, there was no interaction between beverage condition and time among those assigned to drink with a friend—familiar dyads consuming both alcohol and control beverages tended to move closer as the interaction progressed, with no significant differences in the extent of physical distance reductions across beverage conditions, \( b = -0.08, P = 0.671, 95\% \text{ CI}[-0.43, 0.28]\).

Discussion
Maintaining physical distance during social exchange is among the most effective means of curtailing virus spread, but evidence is lacking surrounding the effects of the world’s most widely consumed social drug on physical distancing behaviors. In the current study, alcohol caused individuals to draw significantly closer to an unfamiliar interaction partner as time passed and intoxication level increased. In contrast, alcohol had no impact on physical distance among those in a familiar social context. Considered together with prior research (8, 9, 12), results of the current study suggest that alcohol might act to overcome the natural caution that often characterizes novel social spaces and promote proximity seeking with a stranger. Alcohol is known to impair judgment and promote violations of social restrictions (14), and thus it is notable that we observed significant effects of alcohol on physical distance even in a trial conducted prepan-demic, and further that we observed such effects even given natural constraints on proximity seeking imposed by the seated paradigm. When considered in terms of the length of a typical drinking session, the rate of change estimated in the current study would result in physical distance reductions with potentially important implications for virus spread (>50 cm reduction per 3-h drinking session).

The effects of consuming alcohol present us with an inherent contradiction. The same substance that lifts the spirits and forges social connections can fuel addiction, rupture close relationships, and drive risky decisions (8, 14). Rarely has the fundamental tension of alcohol’s effects appeared so stark as it has during the COVID-19 pandemic. At a time of increased isolation and monotony, and a resultant yearning for a sense of community and novelty offered by drinking environments, these findings offer a sobering piece of evidence to consider in developing public health policy.

Materials and Method
All procedures were reviewed and approved by the University of Illinois Institutional Review Board. Young, healthy social drinkers (\( N = 212 \)) were recruited from December 2018 to March 2020 for a trial examining alcohol’s effects in social context (NCT03449095; see SI Appendix, Supplementary Information Text for detailed methods). To enroll, participants were required to identify at least one eligible friend. On the day of their visits, after signing consent, participants were randomly assigned to drink either an alcoholic (target peak BAC 0.08%) or a nonalcoholic beverage in the company of either their own friend (i.e., familiar condition) or the friend of another participant (i.e., stranger condition). To ensure no prior familiarity in the stranger condition, participants were individually introduced at study initiation (12). In line with alcohol-administration guidelines that address carryover effects (12, 15), the present study employed a between-subject design yielding a total of four experimental conditions: Alcohol/Familiar (\( N = 52; 46\% \text{ female} \)), Alcohol/Strangers (\( N = 56; 57\% \text{ female} \)), Control/Familiar (\( N = 48; 50\% \text{ female} \)), and Control/Strangers (\( N = 56; 57\% \text{ female} \)). Participants were aware of their beverage condition assignment (SI Appendix, Supplementary Information Text). For beverage administration, dyad members were seated across from one another around a round table (~90-cm diameter). Beverages were administered in three equal parts over 36 min, during which time participants were allowed to interact freely while their behaviors were videotaped. Computer-vision algorithms were employed to identify the position of each participant’s face at 10-s intervals throughout the drink...
period, resulting in a dataset comprising over 20,000 observations (Fig. 1). Linear mixed models estimating random slopes examined change over time within dyads in physical distance over the course of the interaction. Given delays in pharmacological alcohol action (12), over-time analyses focused on within-dyad change over time in distance estimated within stranger and friend dyads assigned to receive alcohol and control beverages.

### Table 1. Baseline (cm) and change over time (cm/min) in physical distance estimations within stranger and friend dyads assigned to receive alcohol and control beverages

<table>
<thead>
<tr>
<th></th>
<th>Stranger</th>
<th></th>
<th>Friend</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>95% CI</td>
<td>P</td>
<td>95% CI</td>
</tr>
<tr>
<td><strong>Change over time in distance (minutes 6–36)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>−0.29</td>
<td>−0.43, −0.16</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>−0.06</td>
<td>−0.23, 0.10</td>
<td>0.458</td>
<td></td>
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<tr>
<td><em><em>Baseline distance</em> (minutes 0–6)</em>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>142.86</td>
<td>136.19, 149.52</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>137.19</td>
<td>128.86, 145.52</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

*For both Friend and Stranger dyads there were nonsignificant baseline group differences in physical distance between alcohol and control conditions: Strangers, b = −5.67, P = 0.292; Friends, b = 4.91, P = 0.424. In contrast to within-dyad effects, which hold constant many sources of noise, direct between-group comparisons in the current study are more likely to be impacted by variability associated with extraneous factors—e.g., precise angle of participants’ chairs and large height differentials. Thus, primary analyses focus on within-dyad change over time. See SI Appendix, Supplementary Information Text for details of physical distance approximations.

### Data Availability

All study data are included in the article and/or supporting information.

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