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**THEME ARTICLE (INVITED)**

# Temporal Interactions Between Social Motivation and Behavior In Daily Life Among Individuals at Clinical High-Risk for Psychosis

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***Background and Hypotheses*: Poor social functioning is common among individuals at clinical high-risk (CHR) for psychosis and is associated with greater likelihood of conversion. Unfortunately, processes contributing to social impairment are unclear, making social functioning difficult to improve via treatment. The current study examined whether abnormalities in social functioning result from aberrant temporal interactions between social motivation and behavior. *Study Design*: Participants included 105 individuals at CHR and 62 healthy controls (CN) who completed 6 days of ecological momentary assessment. Multilevel models examined time-lagged interactions between social behavior and motivation. *Study Results*: CHR and CN did not differ in social motivation; however, CHR were less likely to interact with family and coworkers and more likely to engage in interactions via phone and text/social media. Autocorrelations indicated that social behavior and motivation were generally consistent across time in CHR and CN groups. Time-lagged analyses indicated that both groups had an increase in social motivation across time when they were alone and a decrease in social motivation across time when they were with others. However, the relative decrease when with others and increase when alone were less robust in CHR than CN, particularly for in-person interactions. Social motivation at time t did not differentially impact social partner or modality at time t+1 in the groups. *Conclusions*: Findings suggest that social behavior and motivation have different temporal interactions in CHR and CN. Psychosocial interventions may benefit from targeting the frequency of social behavior with specific partners and modalities to change social motivation.**

*Key words:* digital phenotyping/experience sampling/Ultra high-risk

## Introduction

Impairments in social functioning are common among youth at clinical high risk for psychosis (CHR)[1–6] and are associated with greater probability of transitioning to a full psychotic disorder.[7–11] Although social functioning is a critical target for early identification and prevention of psychosis, attempts to improve social functioning via pharmacological and psychosocial interventions have been unsuccessful.[12]

Abnormalities in social functioning have primarily been documented using laboratory-based assessments, clinical interviews, and self-report questionnaires.[13] These measures produce consistent evidence for deficits in 2 broad components of social functioning across phases of psychotic illness: behavior (ie, spending more time alone, fewer close interactions with partners, being less involved during social interactions) and internal experience (ie, reduced motivation/interest, preference for being alone).[3,14–18] However, these methods have been criticized for poor ecological validity and low reliability,[19–21] which make it unclear whether social impairment in CHR reflects: (1) main effects of either behavior or motivation or (2) interactions between behavior and motivation that unfold across time (eg, whether being in a certain social context predicts reductions in social motivation later in the day).

To capture social behavior and motivation in more ecologically valid contexts, researchers have begun relying on ecological momentary assessment (EMA).[22–25] EMA involves the collection of surveys in the context of daily life, typically sampling multiple times per day for several days. Surveys in studies examining social functioning usually assess internal experience (eg, how interested a participant is in a social interaction or how much they desire to interact with others) and social behavior (eg, whether they are interacting with another person or not, whom they are interacting with, and the modality of interaction). These methods have demonstrated adequate psychometrics and address several limitations impacting other methods used to study social functioning (eg, clinical interviews, trait questionnaires, and laboratory tasks).[13] Using EMA, studies on social functioning have demonstrated specific types of deficits in behavior (eg, spending more time alone, spending less time with unfamiliar and familiar others, and lower degree of involvement in social interactions) and internal experience (eg, greater preference for being alone when with others, less positive emotion and more negative emotion when alone, and more social stress) in schizophrenia (SZ).[26–31] Few studies have examined temporal (ie, time-lagged) interactions between social behavior and internal experience in SZ; however, there is some evidence that internal experience at one timepoint predicts the likelihood of engaging in social behavior at the next timepoint.[28] Collectively, these cross-sectional and time-lagged EMA studies have guided intervention development by refining relevant behavioral targets and identifying the psychological mechanisms that may underlie them in SZ.[32–34]

Despite evidence for the utility of EMA for studying social functioning in the SZ-spectrum,[13] very few studies have used EMA to study social behavior and internal experience in CHR. The majority of prior studies have used EMA to evaluate the diathesis-stress model, finding that stress is elevated during social contexts and precedes state exacerbations in symptoms.[23,35–40] However, there is preliminary evidence for abnormalities in both internal experience and social behavior, where lower social drive measured via EMA predicts later increases in social functional impairment measured 2 years later via clinical interview.[41] Thus, although there is evidence for impairments in social functioning in CHR from multiple methods, it is unclear whether these deficits reflect impairments in social behavior, social motivation, or dysfunctional interactions between these 2 processes.

The current study used EMA to study social functioning in CHR compared to healthy controls (CN). Analyses examined main effects of group status on social behavior and social motivation, and time-lagged models were used to examine the direction of the relationship between social motivation and behavior. Specifically, we examined the autoregressive effects of social behavior at time t on the change in social motivation at time t+1, as well as the time-lagged effect of social motivation at time t on subsequent changes in social behavior from time t to t+1. These time-lagged analyses allowed for the estimation of temporally causal effects of one variable on the other measured at a subsequent timepoint.

We hypothesized that:

(1) CHR would evidence reductions in social behavior based upon prior EMA and clinical rating data, as well as social motivation based on prior clinical rating scale data[3,42];
(2) CHR would show a stronger autocorrelation of both social behavior and social motivation than CN, suggesting greater pervasiveness and temporal stability of the behavioral and experiential components of social dysfunction. This hypothesis was based on prior evidence indicating consistency of social functioning impairments in CHR using methods other than EMA[11,43];
(3) CHR would show a stronger time-lagged effect of social motivation on social behavior than CN, suggesting that low social motivation leads to subsequent reductions in social behavior in CHR. This hypothesis was based on prior evidence indicating that low social drive assessed via EMA predicts longitudinal decline in social functioning measured via clinical interview at 2-year follow-up[41];
(4) CHR and CN would evidence different patterns of the time-lagged effect of social behavior on social motivation suggesting that different social partners and modalities contribute to reductions in social motivation in CHR than CN.

## Methods

### *Participants*

Participants included 105 CHR youth and 62 CN. CHR participants were recruited from clinical research programs at the University of Georgia, Northwestern University, and Emory University that perform diagnostic evaluations for early psychosis referrals. Community CN were recruited at the University of Georgia using printed and online advertisements. Study procedures were approved by the local institutional review boards.

The Structured Interview for Psychosis-Risk Syndromes (SIPS[44];) was used to determine whether CHR participants met criteria for progression or persistence for one or more of the 3 prodromal syndromes. The SIPS and Structured Clinical Interview for DSM-5 (SCID-5[45];) were also used to rule out the presence of a lifetime psychotic disorder in CHR. CN did not meet current diagnostic criteria for any psychiatric disorder on the SCID-5. Lifetime mood disorder diagnosis was present in 66% of the CHR sample.

CHR and CN did not significantly differ in age, sex, race, personal education, or parental education (see table 1); however, there was a trend toward CHR being slightly older than CN. CHR completed significantly fewer EMA surveys than CN (see table 1). Participants were not excluded based on EMA survey adherence, consistent with methodological recommendations for handling EMA

**Table 1.** Group Demographic and Clinical Characteristics

| | CHR (*n* = 105) | CN (*n* = 62) | Test Statistic $X^2/F$ | *P*-value |
|---|---|---|---|---|
| Age | 22.36 (4.11) | 21.32 (3.02) | 3.01 | .08 |
| Parental education | 15.34 (2.88) | 15.94 (2.78) | 1.77 | .18 |
| Participant education | 14.04 (2.45) | 14.4 (1.49) | 1.09 | .30 |
| Male % | 22.2% | 21% | 0.03 | .85 |
| Race % | | | 4.21 | .52 |
| African American | 13% | 8.1% | | |
| White | 52.8% | 66.1% | | |
| Asian American | 13% | 12.9% | | |
| Hispanic/latino | 10.2% | 6.5% | | |
| Biracial | 10.2% | 4.8% | | |
| Other | 0.9% | 1.6% | | |
| Student or working % | 75% | 100% | 16.9 | <.001 |
| Relationship status | | | 1.8 | .62 |
| Single % | 54.0% | 64.9% | | |
| Married % | 7.0% | 5.3% | | |
| Committed dating % | 37.0% | 28.0% | | |
| Separated % | 2.0% | 1.8% | | |
| EMA survey adherence; M (SD) | 59.5% (24.1%) | 71.65% (21%) | 10.94 | .001 |

*Note.* CHR, clinical high-risk; CN, control.

data and the robustness of mixed-effects models in accounting for missing data.[46,47]

### *Procedures*

Study procedures were completed across 3 phases.

*Initial Laboratory Visit.* Participants first provided informed consent. Afterward, clinical, diagnostic, and symptom interviews were performed. CHR diagnosis was verified via consensus meetings within and across each site. Next, participants downloaded the mEMA app (ilumivu.com) to their personal smartphone or an Android phone provided for the purposes of the study. Training on app use was provided by research staff and participants completed a practice EMA survey.

*EMA Surveys.* EMA was completed in 6 days. Eight surveys per day were administered across 90-minute epochs between 9 AM to 9 PM. Surveys were available for 15 minutes. On average, surveys took <5 minutes to complete and utilized skip logic to minimize time burden.

Social behavior was evaluated in relation to interaction partner and modality. Specifically, participants were provided with a list of options designating 7 possible social interaction partners (significant other, family/ roommates, friends, coworkers/ classmates, doctor/ therapist, strangers, or no one/alone) and asked to select which they had interacted with in the last 15 minutes. When a social interaction was indicated, participants then selected which modality of social interaction was used via the following list: In-person, phone/ video call, or electronically (text, social media, etc).

Social motivation was assessed in each survey. During instances where participants reported being in a social interaction, they rated their interest in the social interaction. When they indicated not being in a social interaction they rated their desire to be in a social interaction. All responses were made on a 0–100 sliding scale which was transformed to a 0–10 scale for analyses (see supplementary materials for EMA survey items).

*Return to Laboratory.* Participants returned to the lab after the 6-day EMA period to receive compensation in the amount of $30 per hour for interviews and $1 per EMA survey completed. There was also a bonus payment (up to $60) for completing 5 or more surveys per day and >80% of surveys.

### *Data Analysis*

First, multilevel linear and logistic regression was used to examine group differences in social motivation and behavior, respectively.

Autocorrelations were calculated within each group to look at the temporal consistency of social behavior in terms of partner type, modality of interaction, and social motivation. Autocorrelations were followed with mixed-effects models of the Autocorrelation (ie, the effect of a variable at time t on itself at t + 1) by group (CHR, CN) to determine whether the strength of autocorrelation for each of the aforementioned variables differed by group.

Multilevel linear regression models examined the effect of social behavior at time t on the change in social motivation from time t to t+1. Separate models were run for overall behavior (alone vs. not), social partner (no one/ alone, family, significant other, coworkers/classmates, friends, and strangers), and social modality (no one/alone, in-person, electronic [text, social media, etc.], phone/video call). Change over time was first evaluated through autoregression models (the effect of social motivation at t on t+1; higher change scores reflect increases in motivation over time) then followed by change score models (social motivation at t+1 minus time t). Change score analyses did not use multilevel models when there was zero variance in random intercepts causing singular model fit.

Multilevel logistic regression models examined the effect of social motivation at time t on the change in social behavior at time t+1. Separate models were run for overall social behavior, social partner, and social modality. All models evaluated effects on behavior at t+1 controlling for behavior at t (ie, models accounted for the autoregression). No change score models were conducted due to behavior being a binary variable.

All models (except overall social behavior on change in motivation) used multilevel modeling with random intercepts within-person and day in order to account for nesting and repeated measures in the data. Random slopes were not used because effects were either based on categorical variables or random slopes resulted in singular model fit. Multilevel models were selected because they are robust to missing data and thus do not require imputation which could bias the time-lagged models.[46,47]

Analyses were conducted using R version 4.2.2.

## Results

### *Group Differences in Social Motivation and Behavior*

Inconsistent with hypotheses, groups did not significantly differ in social motivation and largely did not differ in frequency of social behavior. However, CHR had fewer interactions with coworkers, more interactions with significant others, and more interactions via phone calls and electronic modalities (see table 2).

### *Autocorrelation of Social Behavior and Social Motivation Across Time*

Autocorrelations were generally high in both groups for all variables. Interactions with strangers and phone call modality had the lowest autocorrelation (see table 3). Inconsistent with hypotheses, autocorrelations were of similar magnitude in both groups and the Autocorrelation × group effects were nonsignificant.

*Time-Lagged Analyses Examining the Effect of Social Behavior (Partner, Modality) at Time t on the Change in Social Motivation from Time t to t+1*

There was no overall effect of social behavior on social motivation. However, there was a significant group × social motivation × social partner interaction (see table 4). As can be seen in figure 1, for CN the autoregression of motivation was significantly lower (ie, less stable) when with a significant other than other types of partners. For CHR, the stability of social motivation did not differ across types of partners (see figure 1). Between-group differences in the autoregressive slope were evident for significant others and coworkers, such that when CHR interacted with significant others at time *t* they had greater consistency in social motivation than CN at *t*+1. Conversely, when CN were with coworkers at time *t* they had greater stability of social motivation at time *t* + 1 than CHR (see figure 1).

Follow-up change score analyses examining group differences were conducted to determine the directionality of the autoregressive effects (see table 4 and figure 2). Both groups had an increase in social motivation across time when they were alone, as well as a decrease in social motivation across time when they were with others.

**Table 2.** Group Differences in Social Behavior and Motivation

| | CN | CHR | Difference |
|---|---|---|---|
| Interaction partner | | | |
| Alone | 967 (45.23%) | 1350 (45.17%) | OR = 0.94 |
| Coworkers/ classmates | 283 (13.24%) | 303 (10.14%) | OR = 0.55* |
| Family | 448 (20.95%) | 654 (21.88%) | OR = 1.07 |
| Friends | 459 (21.47%) | 594 (19.87%) | OR = 0.83 |
| Significant other | 299 (13.99%) | 676 (22.62%) | OR = 3.38* |
| Strangers | 126 (5.89%) | 163 (5.45%) | OR = 0.96 |
| Modality | | | |
| In-person | 1136 (53.13%) | 1478 (49.45%) | OR = 0.84 |
| Phone call | 86 (4.02%) | 237 (7.93%) | OR = 1.92** |
| Electronic | 131 (6.13%) | 303 (10.14%) | OR = 2.57* |
| Social motivation | 5.03 (3.19) | 5.09 (3.19) | $t = 0.21$ |

*Note*. Values for social context are *n* (%) while values for social motivation are *m* (SD). CHR, clinical high-risk.
*$P < .05$, **$P < .01$, ***$P < .001$.

**Table 3.** AutoCorrelations in Social Behavior and Social Motivation in Clinical High-Risk and Control Groups

| | CHR | CN | Autoregression × Group |
|---|---|---|---|
| Social interaction partner | | | |
| Significant other | 0.635 | 0.595 | $\chi^2 = 3.55$, $P = .06$ |
| Family | 0.476 | 0.358 | $\chi^2 = 0.05$, $P = .828$ |
| Friends | 0.402 | 0.425 | $\chi^2 = 0.38$, $P = .537$ |
| Coworkers | 0.489 | 0.447 | $\chi^2 = 3.29$, $P = .07$ |
| Strangers | 0.242 | 0.274 | $\chi^2 = 0.2$, $P = .658$ |
| Alone | 0.441 | 0.374 | $\chi^2 = 0.03$, $P = .856$ |
| Social interaction modality | | | |
| In-person | 0.469 | 0.389 | $\chi^2 = 0.06$, $P = .806$ |
| Phone | 0.285 | 0.208 | $\chi^2 = 1.17$, $P = .279$ |
| Electronic | 0.374 | 0.433 | $\chi^2 = 1.09$, $P = .296$ |
| Internal experience | | | |
| Social motivation | 0.481 | 0.482 | $\chi^2 = 1.32$, $P = .25$ |

*Note*. All autocorrelations within group were significant at $P < .001$. CHR, clinical high-risk

**Table 4.** Omnibus Terms in Social Motivation and Behavior Models

| Model | Group | Social Motivation | Social Behavior | Group × Motivation | Group × Behavior | Motivation × Behavior | Group × Motivation × Behavior |
|---|---|---|---|---|---|---|---|
| Social behavior on motivation | | | | | | | |
| AR by overall | 1.12 | 46.43*** | 0.25 | 1.32 | 1.47 | 0.05 | 0.5 |
| AR by partner | 0 | 19.29*** | 21.93*** | 0.1 | 19.63** | 16.18** | 16.42** |
| AR by modality | 0.02 | 24.48*** | 3.05 | 0.01 | 2.77 | 6.21 | 4.18 |
| Change by overallA | 7.29** | — | 180.88*** | — | 21.78*** | — | — |
| Change by partner | 13.32*** | — | 235.27*** | — | 34.29*** | — | — |
| Change by modality | 14.81*** | — | 190.61*** | — | 25.71*** | — | — |
| Social motivation on behavior | | | | | | | |
| Overall | 0.32 | 4.49* | 12.41*** | 0.12 | 0.14 | 0.05 | 0 |
| Partner | 0.34 | 3.57 | 19.71** | 0.05 | 5.67 | 3.77 | 4.38 |
| Modality | 0.22 | 4* | 17.93*** | 0.1 | 2.7 | 5.86 | 3.21 |

*Note.* All values are $\chi^2$ omnibus terms except noted with $^A$, where values are *F*; AR, Autoregressive model; * $P < .05$; ** $P < .01$; *** $P < .001$.

However, inconsistent with hypotheses, the relative decrease when with others and increase when alone was less robust in CHR than CN.

When these effects were further broken out by social interaction partners, both groups showed significantly greater decreases in motivation across time when interacting with most partners compared to when alone (see figure 3). However, there were significant group differences for the change in social motivation from time *t* to *t*+1, following interactions with family, coworkers, and strangers. When interacting with family members and coworkers at time *t*, CN had significantly greater decreases in social motivation compared to CHR. When interacting with strangers at time *t*, CN had significant increases in social motivation from time t to t+1, while CHR did not show significant change.

When broken out by social modality, all means of social interaction at time *t* decreased social motivation to a greater extent than being alone in both groups (see figure 4). However, CHR displayed a less robust decrease in social motivation across time than CN when engaged in in-person social interactions at time *t*.

*Time-Lagged Analyses Examining the Effect of Social Motivation at Time t on the Change in Social Behavior from time t to t+1*

Autoregressions indicated that in both groups, greater social motivation was associated with greater probability of being alone above and beyond autocorrelation (see table 4). Inconsistent with hypotheses, social motivation did not differentially impact social partners or social modality across groups. Both groups had a lower probability of being alone at *t*+1 compared to instances when they were not with a partner. Contrasts between partners were nonsignificant.

## Discussion

EMA yielded several key observations regarding social behavior and motivation in CHR. First, although the CHR group as a whole demonstrated social functioning levels comparable to other CHR studies,[3,48] there was minimal evidence for a pervasive deficit in social behavior. Rather, abnormalities were more nuanced across different social partners and modalities of interaction. In particular, CHR were less likely than CN to interact with coworkers (which likely reflects reduced opportunity), but more likely to interact with significant others. CHR and CN also did not differ in the frequency of in-person interactions, but CHR had more interactions via phone calls and electronic (eg, text/social media chat) modalities. It is unclear whether these CHR findings differ from patients diagnosed with SZ due to inconsistencies among prior studies. For example, past EMA studies show mixed evidence for whether SZ spend less time with familiar and unfamiliar others than CN.[29,49–51] Also, at the group level EMA studies in SZ and CHR provide inconsistent support for a deficit in social motivation.[26,42,50,52–54] Thus, across the SZ-spectrum and phases of illness, when measured via EMA, abnormalities in social behavior and motivation appear less extensive than previously assumed based on other methods (clinical interview, questionnaires, and laboratory-based tasks). EMA measures of social motivation/behavior may be more valid than retrospective reports made on clinical interviews or questionnaires that may be biased by cognitive impairment, dysfunctional beliefs, social desirability effects, etc. EMA may provide more precise information about the nature of deficits by avoiding such limitations.

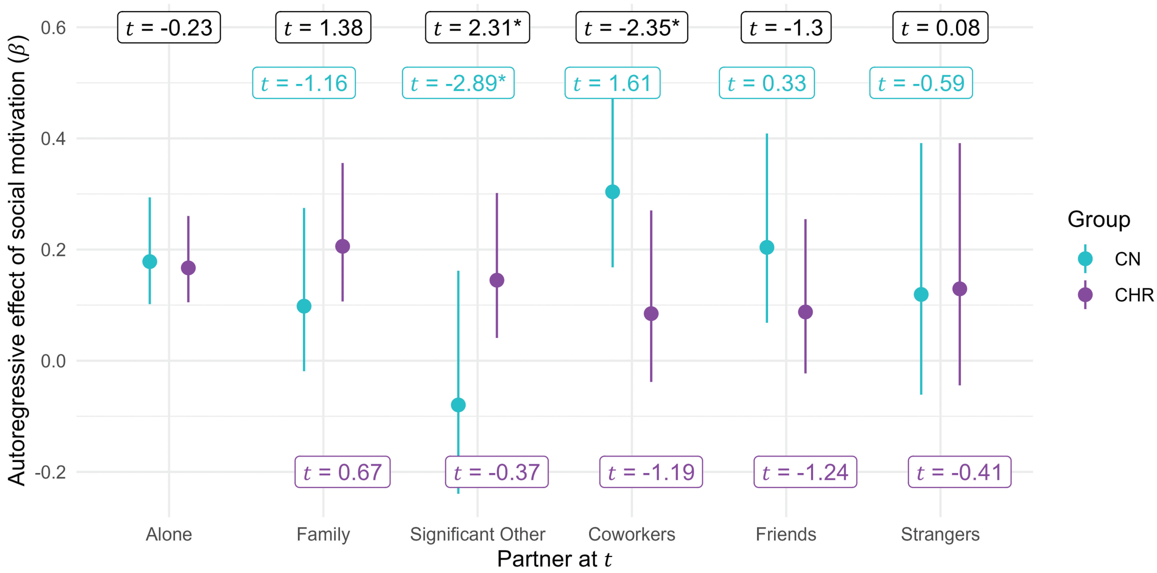


**Fig. 1.** The autoregressive effects of social interaction partner at time t on social motivation from time t to t+1. See the online article for the color version of this and the remaining figures.

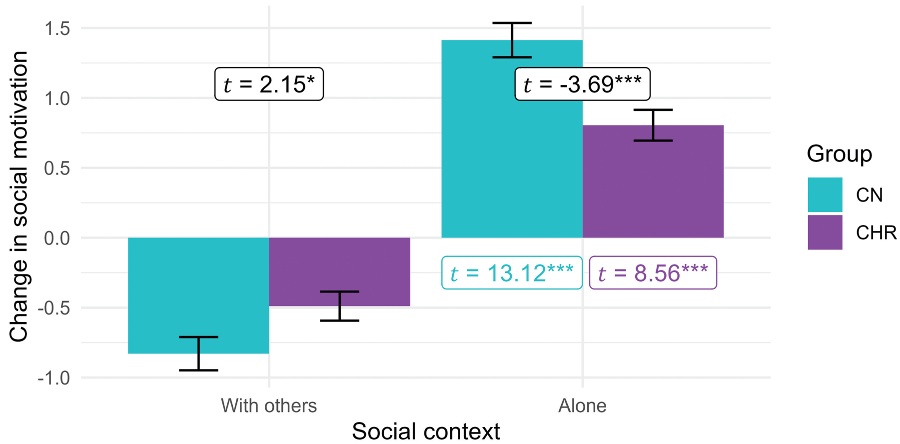


**Fig. 2.** The effects of social behavior at time t on the change in social motivation from time t to t+1.

Second, autocorrelations examining the consistency of social behavior and motivation across time were generally high in both CHR and CN groups. However, CHR showed higher autocorrelations than CN for contexts where they were with significant others and coworkers. These findings extend prior studies which reported moderate stability of social functioning impairments in CHR across long periods of time (eg, 6 months to 2 years) using clinical interviews and trait questionnaires.[11,43,55,56] EMA results, therefore, show that among narrowly defined epochs within a day, CHR remains active similar to or moreso than CN once they become socially active.

Third, time-lagged analyses indicated that CHR and CN had different patterns of temporal interactions between social motivation and social behavior. Both groups had an increase in social motivation across time when they were alone, as well as a decrease in social motivation across time when they were with others. However, the relative decrease when with others and increase when alone was less pronounced in CHR than CN suggesting that social motivation is less modulated by changes in external context in CHR. There are several potential explanations for these findings. When with others, CN social needs may be met during social interactions and motivation/interest in future social activities likely diminish quickly after the interaction ends. Our findings suggest that CHR decrease their level of social motivation following a social interaction less quickly, perhaps because their social needs have not been met (eg, due to social skills deficits that impact interaction quality). Other mechanisms may be involved when participants are alone and asked how much they want to be interacting with someone. To answer the EMA

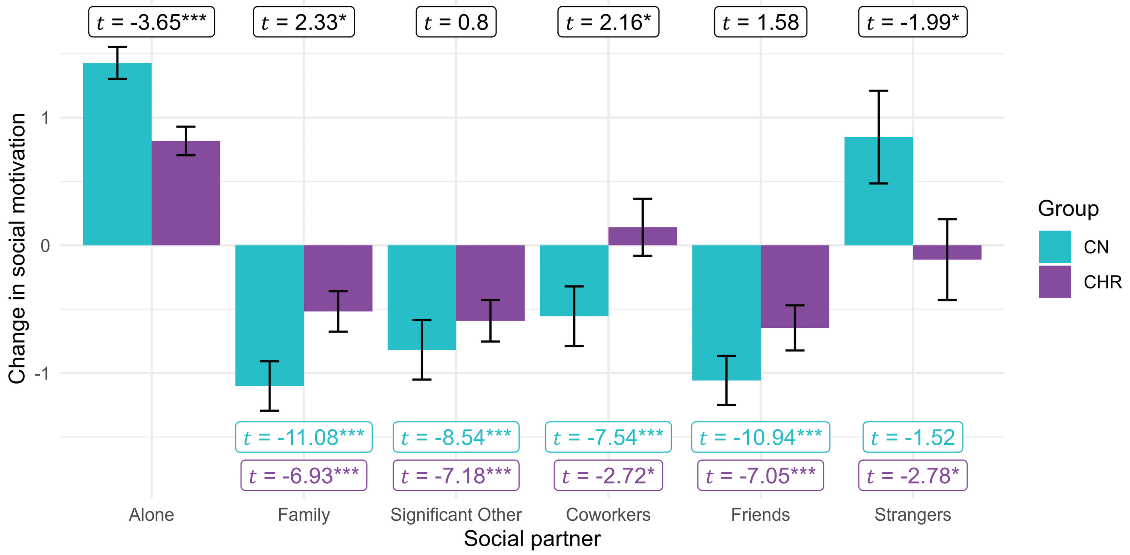


**Fig. 3.** The effects of social interaction partner at time t on the change in social motivation from time t to t+1.

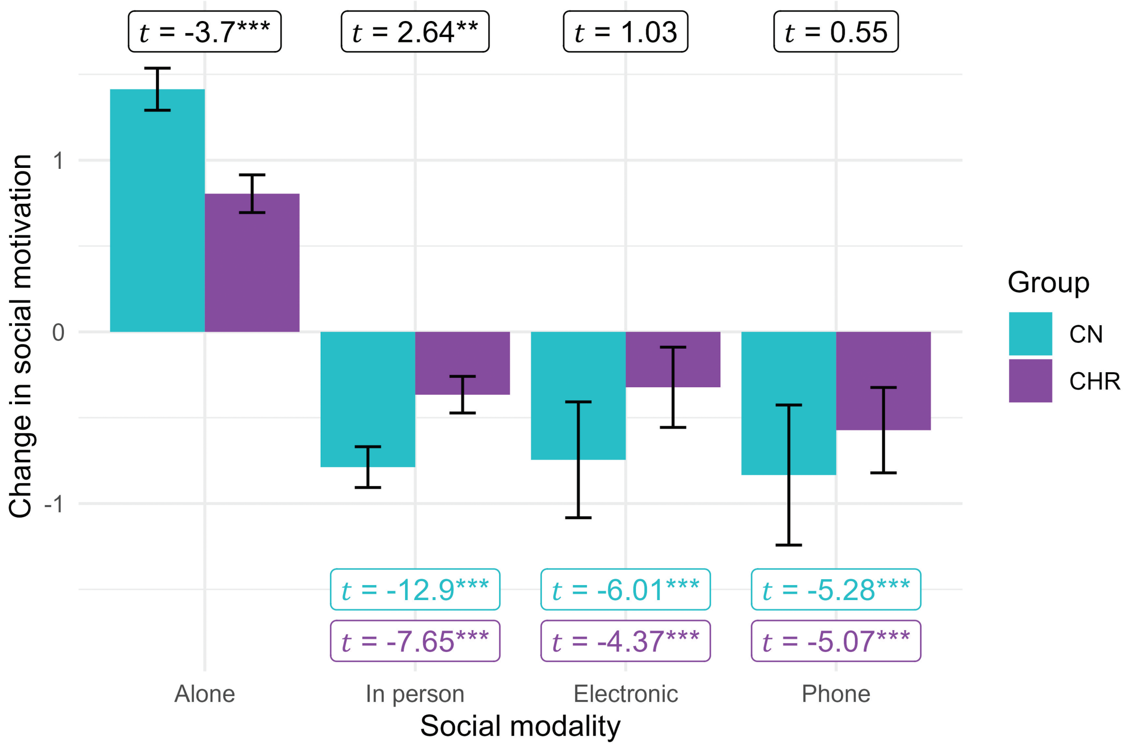


**Fig. 4.** The effects of social interaction modality at time t on the change in social motivation from time t to t+1.

probe while alone, participants must generate mental representations of future social interactions. These representations can vary in their level of detail and extent to which they activate emotions and motivation for social behavior. Due to difficulties with generating mental representations of future activity, CHR may not simulate future activities in a way that inspires social desire. Thus, deficits that occur when alone vs. when with others may result from different processes.

Fourth, when the aforementioned effects of social behavior on motivation were further broken out by type of social interaction partner, important group differences emerged. Specifically, although both groups showed significantly greater decreases in motivation across time when interacting with any partner compared to when alone, CHR failed to have the same magnitude of decrease in social motivation across time when interacting with family members and coworkers. The greater decrease in social motivation across time in CN than CHR may suggest that interactions with friends and coworkers were more likely to fulfill social needs of CN more so than CHR. Interestingly, the reverse pattern occurred for interactions with strangers, which decreased social motivation in CHR and increased it in CN. This pattern may suggest that interactions with strangers are more socially meaningful in CHR than CN and may be capable of fulfilling some of their social needs.

Fifth, CHR were more likely than CN to interact with others via phone call and electronic (ie, text, social media chat) modalities. These findings are consistent with past studies reporting greater social media and internet use in CHR than CN.[57–59] The lack of group differences for in-person interactions was perhaps surprising given that retrospective self-report scales typically indicate a smaller social network in CHR.[48,60] However, time-lagged interactions did indicate that social modality differentially influenced the effect of social behavior on motivation across groups, such that in-person interactions were less likely to produce robust changes in social motivation across time in CHR than CN. Thus, even though they were not lacking in frequency, in-person social interactions may not be as beneficial in driving motivation for future interactions in CHR.

Certain limitations should be considered when interpreting these findings. First, the study was cross-sectional. The relevance of these EMA findings for long-term longitudinal outcomes (eg, conversion, decline in social function across time) is therefore unknown. Second, CHR participants had lower EMA survey adherence than CN. Although missing data was accounted for via the multilevel modeling approaches selected and there was no significant correlation between EMA adherence and social motivation/behavior results, the possibility that adherence impacted EMA results cannot be ruled out. However, this seems unlikely given that adherence rates did not significantly correlate with social motivation or behavior. Third, The majority of the sample was female and it is unclear whether this impacts generalization of results to males. Finally, younger participants enrolled in the study may have engaged in qualitatively different social activities than older participants (eg, more circumscribed social activities that are driven by obligatory activities/settings, such as those that occur at school). Although these types of interactions would be equally likely to impact both groups since they were demographically matched, it is unclear how such qualitative factors might influence cross-sectional or time-lagged EMA results.

Despite these limitations, findings clarify the nature of social functioning impairment in CHR. Similar to several EMA studies in SZ,[50,53,61] social motivation measured via EMA appeared relatively intact in CHR. This was true with regard to omnibus between-subjects effects across all timepoints, as well as time-lagged analyses examining the effects of social motivation at time t on social behavior at time t+1. However, impairments in social behavior were noted, including decreased time spent with coworkers and increased interactions via phone calls and electronic modalities. Importantly, social behavior had time-lagged effects on social motivation, such that social behavior was less likely to lead to changes in social motivation in CHR than in CN, particularly following in-person interactions. These findings highlight the nuanced nature of social dysfunction in CHR and suggest that social motivation may be impaired, depending on the context of social behaviors that individuals have recently engaged in. Just-in-time digital interventions that take context into account may be beneficial for treating social motivation deficits as they occur in the real world. Such interventions may benefit from targeting social behavior to change motivation, rather than targeting social motivation to change behavior. Specific behavioral targets might include interaction modality (ie, more in-person, less electronic/phone), as well as partner type (ie, increasing interactions with family members and coworkers rather than unfamiliar individuals). Altering these specific interactions may make social motivation modulate more adaptively across time.

## Supplementary Material

Supplementary material is available at https://academic.oup.com/schizophreniabulletin/.

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## Conflict of Interests

Dr. Gregory Strauss is one of the original developers of the Brief Negative Symptom Scale (BNSS) and receives royalties and consultation fees from Medavante-ProPhase LLC in connection with commercial use of the BNSS and other professional activities; these fees are donated to the Brain and Behavior Research Foundation. Dr. Strauss has received honoraria and travel support from Medavante-ProPhase LLC for training pharmaceutical company raters on the BNSS. In the past 2 years, Dr. Strauss has consulted for and/or been on the speaker bureau for Minerva Neurosciences, Acadia, Lundbeck, Sunovion, Boehringer Ingelheim, and Otsuka pharmaceutical companies. All other authors have no relevant disclosures to report.

## Data Availability Statement

Data is available from the authors upon request.

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