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Social cognitive abilities predict psychosocial dysfunction in Major Depressive Disorder

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Abstract

Background: Major depressive disorder (MDD) is associated with social cognitive deficits (e.g., poor affect recognition, impaired theory of mind). However the contribution of social cognitive issues to psychosocial dysfunction in MDD (e.g., occupational functioning, interpersonal relationships) has not been investigated. The current study evaluated the relationship between specific social cognitive domains (e.g., prosody interpretation) and psychosocial dysfunction in subjects with lifetime MDD, as well as currently depressed, remitted, and healthy (HCs) subjects.

Method: Data were obtained from 213 participants in the Cognitive Function and mood study (CoFaMS), a cross sectional study of mood, social cognition, cold cognition, and psychosocial functioning in mood disorders. Participants' (current MDD n= 42, remitted MDD n= 69, healthy controls (HC) n= 102) social cognitive abilities were assessed using the Social Perception subtest of the Wechsler Adult Intelligence Scale, and psychosocial dysfunction was clinically evaluated with the Functioning Assessment Short Test (FAST).

Results: The results indicated that prosody interpretation, but not facial affect or meaning interpretation, was associated with psychosocial dysfunction in subjects with lifetime MDD, as well as remitted MDD subjects relative to HCs. In contrast, social cognition was not associated with functioning in participants with current MDD, or in HCs.

Conclusions: These results suggest that the relationship between social cognition and psychosocial functioning differs between the acute and remitted stage of illness in MDD, and

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that prosody interpretation should be considered a treatment target in patients with residual psychosocial issues.

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Introduction

Interpreting social information is a ubiquitous and necessary ability in everyday life. Emerging evidence suggests that Major Depressive Disorder (MDD) is associated with deficits in a number of social domains, including body language, eye contact, verbal tone, and prosody (Air, Weightman, & Baune, 2015; Hasselbalch, Knorr, & Kessing, 2011; Weightman, Air, & Baune, 2014). Social abilities are highly reliant on cognitive functioning (e.g., perception, memory and learning), leading researchers to coin the term "Social cognition" for the application of cognition domains in a social context. Social cognition also includes theory of mind; the ability to infer the mental and emotional state of others based (Anselmetti et al., 2009; Frith & Corcoran, 1996). While social cognitive deficits have been identified in acutely depressed (Persad & Polivy, 1993) and remitted MDD patients (LeMoult, Joormann, Sherdell, Wright, & Gotlib, 2009), there is a lack of research on whether these social cognitive deficits lead to functional issues (e.g., occupational dysfunction). The current research addressed this gap in our understanding by investigating the relationship between social cognition and psychosocial functioning in MDD.

Synthesis of social cognitive information requires coordination of several cognitive systems, including, visuospatial and verbal memory, as well as executive and attentional control (Baddeley, 1983, 2002; Weightman et al., 2014). As a result, cold cognitive deficits in MDD may negatively interact with social cognitive issues (Baune et al., 2010; Cambridge, Knight, Mills, & Baune, 2018; Evans, Iverson, Yatham, & Lam, 2014; Knight & Baune, 2018a; McIntyre & Lee, 2016; Weightman et al., 2014). Support for this notion has been found in

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research in ADHD, Bipolar, and Schizophrenia (Anselmetti et al., 2009; Dhar, Been, Minderaa, & Althaus, 2010), with findings pointing to a negative effect of cognitive impairment (e.g., processing speed and executive functioning) on social abilities. For example, Anselmetti et al. found that poor processing speed measured was associated with reduced theory of mind in Schizophrenic, but not healthy, subjects (Anselmetti et al., 2009). The results of this study suggest the interplay between cognitive and social abilities differs between those with and without mental illness. In addition, a factor analysis by Williams et al. on cognitive, social, and general functioning in Schizophrenia identified that impairment in a number of cognitive domains (e.g., working memory, executive functioning) was associated with social cognitive deficits (Williams et al., 2008). Taken together, existing research supports the close relationship between cognitive and social abilities in other mental disorders, and highlights the need for additional research of social cognition in MDD.

It is possible that cognitive deficits in MDD exacerbate social issues by consuming limited cognitive resources, which are often in high demand in social situations. This explanation is supported by Joorman and Gotlib, who found that MDD patients demonstrated reduced ability to expel negative information from working memory in comparison to neutral and sad mood state participants (Joormann & Gotlib, 2008). Considering the cognitive demands of interpreting body language, prosody, language interpretation, theory of mind, and generating responses, it stands to reason that diminished working memory capacity could reduce social functioning in MDD. Negative emotional and social biases may also play an important role in social cognitive dysfunction (LeMoult et al., 2009; McDermott & Ebmeier, 2009). Specifically, expectation of failure and low self-esteem in MDD may cause overly negative interpretation of social information, including increased probability to identify fear and anger

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in facial affect (Bhagwagar, Cowen, Goodwin, & Harmer, 2004), as well as reduced sensitivity to detect happiness in facial expressions (LeMoult et al., 2009). It is possible that residual emotional biases and social issues continue during the remitted stage, however more research is needed to evaluate the role of residual issues in remitted MDD (Air et al., 2015; Hasselbalch et al., 2011)

Current literature suggests that cold cognitive deficits contribute to psychosocial issues in MDD independently of other symptoms (Cambridge et al., 2018; Evans et al., 2014; Knight & Baune, 2018a; McIntyre & Lee, 2016). Specifically, relationships have been identified between several cold cognitive domains (i.e., executive, attention, and memory dysfunction) and issues in occupational functioning, interpersonal relationships, and self-perceived quality of life (Caldirola et al., 2014; Evans et al., 2014; Kim et al., 2016; Knight & Baune, 2018b; McIntyre et al., 2015). Psychosocial issues associated with MDD often persist in symptomatically recovered (i.e., remitted) patients, and are associated with illness relapse (Bortolato, Carvalho, & McIntyre, 2014; Cambridge et al., 2018; Knight, Air, & Baune, 2018; Miller et al., 1998), highlighting a need for greater clinical understanding and improved treatment of issues underlying psychosocial dysfunction. As cold cognition interacts with and is a core component of social cognition, it is reasonable to predict that social cognitive issues could also contribute independently to functional deficits in MDD. No research has yet examined the contribution of social cognition to psychosocial functioning, highlighting the value of the current study. In particular, it is crucial to identify which social cognitive domains (e.g., facial affect recognition, prosody) are linked to functional issues, as these findings can provide specific targets for social-cognitive treatment (Knight & Baune, 2017; Knight & Baune, 2018a; McIntyre & Lee, 2016).

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The current research evaluates the relationship between social cognition and psychosocial functioning in participants with lifetime MDD, current MDD, remitted MDD, as well as healthy controls (HCs). Comparing clinical subgroups enables conclusions regarding the immediate and long term functional effects of social cognitive deficits, which may differ between different stages of illness in MDD (Air et al., 2015). The primary aims of the study were:

(1) To evaluate whether social cognition predicted overall psychosocial functioning.
(2) To identify any relationships between specific social cognitive domains (i.e., affect recognition, prosody, meaning interpretation) and particular psychosocial issues (e.g., occupational functioning).
(3) To examine whether the relationship between social cognition and psychosocial functioning differed between lifetime, current, and remitted MDD patients relative to HCs.

Materials and Methods

Data were obtained from the Cognitive Function and Mood Study (CoFaMS) (Baune & Air, 2016) a cross-sectional analysis of cognition, mood, social cognition, and psychosocial functioning in persons with MDD. Participants with a current episode or previous diagnosis of depression following DSM-IV-TR criteria (American Psychiatric Association, 1994) were included. Exclusion criteria for the CoFaMS were presence of a psychotic disorder, dementia, learning disorders, autism spectrum disorder, or other illnesses associated with cognitive dysfunction (e.g., substance abuse). The CoFaMS study was reviewed by the Human Research Ethics Councils (HRECs) of the Royal Adelaide Hospital (approval number:

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111230) and the University of Adelaide (approval number: H-160-2011), and was conducted in accordance with the Declaration of Helsinki. All participants were verbally informed about study procedures, and read a study information sheet, before providing written consent to participate.

Participants

Participants (*N*= 213) were selected for the current analysis based on completion of standard tests of social cognition (i.e., the Wechsler Advanced Clinical Solutions: Social Perception Subtest (WAIS-ACS)) (Pearson, 2009) and psychosocial functioning (i.e., the Functioning Assessment Short Test (FAST)) (Rosa et al., 2007). Participants were screened for MDD, as well as other psychiatric illnesses, with the MINI 600 diagnostic interview (Sheehan et al., 1998). The MINI is a brief (30-45mins) diagnostic interview, which is designed to detect 17 common DSM-IV diagnoses. Detection of mental disorders with the MINI is consistent with that of the Structured Clinical Interview for the American Psychiatric Association Diagnostic Criteria (SCID), and the Composite International Diagnostic Interview (ICD-10) (Sheehan et al., 1998). Participants were considered currently depressed (*n*= 42) if they reported diagnostic criteria for Major Depression over the past two months (e.g., prolonged sadness, reduced interest in daily activities) according to the MINI. In contrast, remitted MDD subjects (*n*= 69) had experienced a prior depressive episode, but were currently free of illness as reported in the MINI. Remitted subjects also demonstrated mood within the "normal" range according to the Hamilton Depression Scale (HAM-D) (Hamilton, 1960; Trivedi et al., 2006). Healthy controls (*n*= 102) included participants with no lifetime presence of MDD, or any psychiatric illnesses included in the MINI. The mean age of participants was 34.13 (*SD*= 16.38), 130 (61%) were female, and mean years of education was 13.52 (*SD*= 2.45) years.

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Demographic information stratified by MDD status is provided in supplementary eTable 1 in the appendix.

Social Cognitive Assessment

Social cognitive functioning was assessed with the WAIS-ACS Social Perception Subtest. The ACS evaluates social cognitive skills across several domains, including facial affect recognition, prosody, body language, and social interpretation. Standard performance in these tests has been established using data from 800 subjects in the 2005 US census (Holdnack, Goldstein, & Drozdick, 2011; Kandalaft et al., 2012). The three assessment tasks included in the ACS are explained below:

- Affect Naming (ACS Affect): The participant is presented with 24 images of male and female faces, each displaying a particular emotion (i.e., happiness, sadness, surprise, fear, anger, disgust, neutral). An answer sheet is provided to participants, indicating the each of the seven potential responses (i.e., emotions) which could be displayed by each face image. Participants are instructed to select which emotion on the answer sheet best matches that conveyed by the image. Correct answers award a single point, leading to a maximum possible raw score of 24.
- Prosody-Face Matching (ACS Prosody): Participants are presented with six faces, each displaying a particular emotion (i.e., the seven emotions used in the Affect Naming task). A voice is played to the participant, who must match the emotional tone of the speaker with one of the six presented faces. This process is repeated 12 times, for a maximum possible raw score of 12.

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- Prosody-Pair Matching (ACS Pairs): In this task, the participant is presented with four images, each depicting two people interacting. Similar to the face matching task, a voice is played to the participant, who must indicate which image best matches the tone and intention of the speaker. In addition, the participant is instructed to indicate what feeling is conveyed by the tone of voice, and whether the tone of voice changes the meaning of the comment (e.g., sarcasm, humour). If a meaning change does occur, the participant indicates the true meaning/intentions of the speaker. Taken together, performance in the prosody-pair matching task leads to a maximum raw score of 42.

Psychosocial Functioning Assessment

The Functioning Assessment Short Test (FAST) was used to assess psychosocial functioning. The FAST is a clinician administered interview which determines functional deficits in six domains (i.e., autonomy, occupational functioning, cognitive functioning, financial issues, leisure time, and interpersonal relationships) (Rosa et al., 2007). The interviewer measures patient impairment on a 4-point scale, with 0 indicating no difficulties and 3 severe impairment. Domain-specific composite FAST ratings were derived from the mean scores in each domain (i.e., autonomy (*Range:* 0-12), occupational dysfunction (*Range:* 0-15), subjective cognitive dysfunction (*Range:* 0-15), financial issues (*Range:* 0-6), interpersonal relationships (*Range:* 0-18), and leisure time (*Range:* 0-6). Total FAST score was employed as an indication of overall psychosocial functioning, indicated by the sum of FAST subdomains (*Range*: 0-72). Overall and domain specific FAST composite scores were used as outcomes in linear regression analyses.

Statistical Analyses

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Analyses were conducted with SPSS for Windows, version 24 (Bryman & Cramer, 1990). Performance in ACS subtests (e.g., affect naming) were entered as predictors in Linear regression analyses. In the initial analysis, overall psychosocial functioning (i.e., FAST total) was the outcome variable. Subsequent regressions employed FAST subdomains (i.e., autonomy, occupational functioning, cognitive functioning, financial issues, leisure time, and interpersonal relationships) as outcomes. Standardised Beta coefficients were used to determine the strength and direction of the relationship between social cognitive predictors and psychosocial outcomes.

Given the paucity of research in this area, an exploratory analysis approach was elected. Initial analyses examined whether there was a relationship between social cognitive performance in the three domains of the ACS (i.e., Affect, Prosody, Pairs) and overall psychosocial functioning. If an ACS domain was found to significantly predict overall functioning, then follow-up analyses tested which FAST subdomains were significantly associated with this social cognitive domain. Initially, the analyses above were performed for the entire participant sample, and then separately for those with lifetime, current, and remitted MDD, as well as HCs. This approach enabled detection of the social cognition-psychosocial functioning relationship overall, as well as in distinct clinical subgroups (i.e., lifetime, current, and remitted MDD).

One-way ANOVAs and chi-squared tests found no differences in age, sex, or years of education between the current MDD, remitted MDD, and HCs (*ps* > .05). Nevertheless, all analyses included age, sex, and years of education as covariates, as these factors can affect the relationship between depression status and functional outcomes (Evans et al., 2014; Mackin & Areán, 2009). Previous research has indicated that use of selective

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serotonin/norepinephrine reuptake inhibitors (SSRIs/SNRIs) can enhance flattened emotional experience/perception (i.e., emotional blunting) (Goodwin, Price, De Bodinat, & Laredo, 2017); a symptom which could affect social perception in the ACS. Eighteen participants in the lifetime MDD group were taking an SSRI/SNRI (current MDD *n*= 9, remitted MDD *n*= 9), however regression analyses indicated that SSRI/SNRI use was not related to ACS performance or FAST total score (*ps* > .05). As a result, SSRI/SNRI was removed from the model in subsequent analyses.

Multicollinearity of social cognitive predictor variables was low, indicated by variance inflation factors < 4. Given the exploratory nature of the current research, and its use of an existing data set, post-hoc power analyses were not employed (Goodman & Berlin, 1994; O'Keefe, 2007; Weightman et al., 2014). Descriptive statistics are presented by MDD status (i.e., current MDD, remitted MDD, HCs) for ACS subtests, FAST total score, and FAST subdomains, in supplementary eTable 2 in the appendix.

Results

All participants

Initial analyses with the entire participant sample revealed that ACS Prosody was marginally associated with FAST total score. The negative direction of this relationship indicated that greater ACS Prosody ability was linked with reduced psychosocial dysfunction. Neither ACS Affect, nor ACS Pairs significantly predicted FAST total score.

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Follow-up analyses between ACS Prosody and FAST subdomains (i.e., autonomy, occupational functioning, cognitive functioning, financial issues, leisure time, and interpersonal relationships) demonstrated a significant relationship with subjective cognitive dysfunction. No other psychosocial domains were reliably associated with ACS Prosody. Beta coefficients and associated *p* values for the whole group analysis are presented in Table 1.

Please insert Table 1 here.

Stratified Analyses:

Lifetime MDD

In the lifetime MDD group (i.e., current + remitted MDD), ACS Prosody was significantly associated with FAST total score, however ACS Affect and ACS Pairs were not reliable predictors. Follow-up analyses with FAST subdomain outcome variables indicated that ACS Prosody was a significant predictor of perceived cognitive dysfunction and occupational issues. ACS Prosody was not significantly associated with the four remaining FAST subdomains (i.e., autonomy, financial issues, leisure time, and interpersonal relationships). Statistics for the Lifetime MDD group. Statistics for the lifetime MDD group are presented in Table 2.

Please insert Table 2 here.

Healthy Controls

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Regression analysis in the HC group revealed that the relationships between ACS predictor variables and FAST total score did not approach significance (all *p*s > .168). Beta coefficients and *p* values for the HC group are presented in Table 3.

Please insert Table 3 here.

Current MDD

In the current MDD group, regression of FAST total score indicated that ACS predictor variables were not significantly associated with overall functioning (all *p*s > .284). Table 4 provides inferential statistics for the current MDD group.

Please insert Table 4 here.

Remitted MDD

Analyses in the remitted MDD group indicated that ACS Prosody significantly predicted FAST total score, whereas ACS Affect and ACS Pairs were not associated with overall functioning. Separate regressions of FAST subdomains found that ACS Prosody significantly predicted occupational dysfunction, perceived cognitive dysfunction, and interpersonal issues. In addition, the relationship between ACS Prosody and Autonomy approached significance. Inferential statistics for the remitted group are presented in Table 5.

Please insert Table 5 here.

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Discussion

The current results indicate a relationship between social cognitive deficits and functional issues which occurs differentially across clinical subgroups in MDD. Analyses of the entire participant sample indicated a marginal relationship between prosody interpretation (i.e., ACS Prosody) and overall psychosocial functioning, whereas affect recognition (i.e., ACS Affect) and meaning detection (i.e., ACS pairs) were not associated with functional issues. The effect of prosody interpretation on functioning was also found in analysis of lifetime MDD patients. However, splitting analyses across current and remitted MDD groups revealed that the prosody-functioning relationship was only present in subjects with remitted MDD, whereas social cognition was not associated with overall psychosocial functioning in current MDD patients. Likewise, no relationship between social cognition and overall psychosocial functioning was identified in healthy controls. These findings suggest that social cognitive factors play an important role in functioning in the remitted stage of illness, whereas social cognition does not contribute independently during acute episodes of MDD.

In remitted MDD patients, ACS Prosody was associated with occupational dysfunction, interpersonal issues, and subjective cognitive dysfunction. The role of Prosody interpretation in interpersonal and occupational domains is likely explained by the primacy of verbal communication in these areas, which is highly reliant on prosodic information (Hirschberg, 2002). In remitted individuals, residual pessimistic biases could lead to overly negative interpretation of prosodic information (Bourke, Douglas, & Porter, 2010; Weightman et al., 2014) and subsequent occupational and interpersonal issues. In addition, negative prosody interpretation could increase self-perception of social failures, as opposed to an absolute increase in real social failures, which could also lead to poor self-esteem, social avoidance,

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and subsequent functional issues (Judge & Bono, 2001; Leary & Baumeister, 2000). In a similar vein, misinterpretation of prosodic information could be viewed by patients as lapses in cold cognitive abilities (e.g., attention, memory), which may explain the relationship between prosody and perceived cognitive dysfunction. While residual cognitive deficits have been linked with psychosocial deficits in remitted MDD (Shimizu et al., 2013), this study is the first to identify a contribution of social cognition to functioning at the remitted stage. This finding may be of specific interest, as acute social cognitive deficits may be greater in currently depressed individuals (Air et al., 2015), however current results suggest that the effect of these deficits on functioning may be greater in those with remitted MDD. The broad role of prosody interpretation across three psychosocial domains suggests that this aspect of social cognition should be considered a prime target in adjunctive cognitive and psychosocial treatments (Knight & Baune, 2017; McIntyre & Lee, 2016).

The question is raised as to why prosody interpretation contributed to psychosocial dysfunction in remitted, but not currently depressed, individuals. It is possible that psychosocial functioning in acutely depressed patients is influenced to a greater degree by deficits in cold cognition, as cognitive deficits are greater during the acute stage of illness (Hasselbalch et al., 2011; McCall & Dunn, 2003; Rock, Roiser, Riedel, & Blackwell, 2014). Emerging research is consistent with this explanation, as cold-cognitive deficits (e.g., executive functioning, memory) are associated with psychosocial issues (Baune & Air, 2016; Knight & Baune, 2018a; Knight & Baune, 2018b; McCall & Dunn, 2003; Rock et al., 2014), and may therefore override the effect of social cognition in currently depressed patients. Further research is needed to evaluate the role of other social cognitive factors (e.g., theory of mind) in currently depressed individuals (Hasselbalch et al., 2011).

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Social cognition was not associated with psychosocial functioning in healthy controls, suggesting that mentally healthy individuals maintain functioning in everyday life independently of social cognitive abilities(Air et al., 2015; Weightman et al., 2014). Appraisal of descriptive statistics in the current data reveal that HCs and remitted participants demonstrated very similar performance in the ACS (see supplementary Table 2). However, the relationship between social cognition and psychosocial dysfunction was only observed in the remitted MDD group. This discrepancy supports the explanation that features unique to remitted MDD (e.g., residual negative biases, greater perception of social failures) are the mechanism by which social cognitive deficits influence functional outcomes (Bhagwagar et al., 2004; Weightman et al., 2014).

It is noteworthy that prosody interpretation, but not facial affect or meaning interpretation, contributed to functioning. This finding has not been identified previously, as most existing research has focussed on identifying differences in affect recognition and more complex theory of mind judgements (Bhagwagar et al., 2004; LeMoult et al., 2009; Weightman et al., 2014; Zobel et al., 2010), rather than the association of these domains with functional outcomes. The primary role of prosody in functioning may suggest that verbal interpretation is more ubiquitous in everyday communication skills in individuals with remitted MDD than is facial affect recognition or theory of mind judgements.

A limitation of the current study was the measurement of specific social cognitive domains with the ACS Subtests (e.g., ACS Prosody). While these tests provide well-established and quantitative measures affect recognition, prosody detection, and meaning interpretation (Air et al., 2015; Weightman et al., 2014), they do not include a measure which integrates these domains within a complex social interaction. Such a measure would need to involve

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concurrent interpretation of many social cognitive domains in a realistic social scenario, rather than interpretation of single social cognitive domains in isolation. Integrated social cognition scenario tests exist for Asperger Syndrome and Autism (see Brewer, Young, & Barnett, 2017; Dziobek et al., 2006), but have not yet been developed for MDD, and hence could not be applied in the current study. In addition, the cross-sectional nature of this research, should be considered in the interpretation of our findings, such that we demonstrate an acute relationship between social cognitive and psychosocial deficits which should be viewed as preliminary in light of our modest sample size (N= 213). The longitudinal relationship between social cognitive abilities and functional deficits in MDD remains to be examined, presenting a valuable avenue for future research.

The current findings resolve the primary aims of the study, as (1) social cognition is associated with overall psychosocial dysfunction, (2) prosody interpretation, but not facial affect or meaning interpretation, are linked to distinct functional issues in occupational, interpersonal, and cognitive domains, (3) an effect of prosody interpretation on overall functioning was identified in the remitted MDD, but not current MDD, participants. Taken together, our findings suggest that residual social cognitive dysfunction may negatively affect psychosocial functioning after diagnostic recovery, whereas other illness factors, or cold cognitive factors, may be more primary contributors to functioning during the acute stage. These results contribute to our understanding of psychosocial dysfunction in MDD, and suggest that addressing negative prosody interpretation could improve functional outcomes.

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Table 1

Domain specific relationships between ACS predictors and FAST outcomes in the **whole group analysis** (*N*= 213) expressed by standardised Beta coefficients. Upper and lower 95% Confidence interval bounds of Beta coefficients are presented in closed brackets, and *p* values are in parentheses.

ACS Predictors	Psychosocial Outcomes						
	FAST total Score	Autonomy	Occupational Functioning	Subjective Cognition	Leisure Time	Financial Issues	Interpersonal relationships
ACS Affect	.014 [-8.54, 1.034] (.851)	.007 [-.188, .172] (.930)	-.047 [-.337, .180] (.548)	.047 [-.163, .315] (.531)	-.038 [-.124, .075] (.624)	-.006 [-.103, .094] (.935)	.068 [-.160, .419] (.379)
ACS Prosody	-.149, [-2.36, .053] (.061)	-.075 [-.339, .121] (.350)	-.125 [-.590, .070] (.122)	-.183 [-.672, .061] (.019)*	-.062 [-.177, .077] (.437)	-.059 [-.173, .079] (.466)	-.136 [-.691, .049] (.089)
ACS Pairs	-.049 [-5.72, .296] (.532)	-.118 [-.145, .021] (.140)	.036 [-.092, .145] (.659)	.000 [-.110, .110] (.999)	-.008 [-.048, .043] (.923)	-.098 [-.073, .017] (.223)	-.085 [-.205, .061] (.287)

*= Significant at $p < .05$
Linear regression model adjusted for age, gender, and years of education.

Table 2

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Domain specific relationships between ACS predictors and FAST outcomes in the **Lifetime MDD** (*n*= 111) group expressed by standardised Beta coefficients. Upper and lower 95% Confidence interval bounds of Beta coefficients are presented in closed brackets, and *p* values are in parentheses.

ACS Predictors	Psychosocial Outcomes						
	FAST total Score	Autonomy	Occupational Functioning	Subjective Cognition	Leisure Time	Financial Issues	Interpersonal relationships
ACS Affect	.089 [-.767, 1.97] (.385)	.138 [-.095, .467] (.192)	-.017 [-.410, .348] (.873)	.052 [-.248, .428] (.597)	.015 [-.147, 169.] (.891)	.108 [-.061, .188] (.316)	.129 [-.159, .724] (.208)
ACS Prosody	-.227 [-3.57, -.116] (.037)*	-.102 [-.518, .190] (.359)	-.328 [-1.21, -.250] (.003)*	-.277 [-1.00, -.149] (.009)*	-.047 [-.242, .157] (.672)	.078 [-.102, .212] (.488)	-.147 [-.942, .170] (.172)
ACS Pairs	-.051 [-.764, .491] (.641)	-.146 [-.218, .045] (.197)	.140 [-.065, .291] (.211)	-.013 [-.168, .149] (.905)	-.105 [-.109, .040] (.356)	-.108 [-.086, .031] (.346)	-.111 [-.313, .101] (.313)

*= Significant at $p < .05$

Linear regression model adjusted for age, gender, and years of education.

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Table 3

Domain specific relationships between ACS predictors and FAST outcomes in the **Healthy Control** (*n*= 102) group expressed by standardised Beta coefficients. Upper and lower 95% Confidence interval bounds of Beta coefficients are presented in closed brackets, and *p* values are in parentheses.

	Psychosocial Outcomes						
ACS Predictors	FAST total Score	Autonomy	Occupational Functioning	Subjective Cognition	Leisure Time	Financial Issues	Interpersonal relationships
ACS Affect	-.164 [-3.18, .377] (.168)	-.243 [-.460, -.011] (.040)*	-.192 [-.622, .066] (.112)	-.084 [-.421, .196] (.470)	-.180 [-.215, .030] (.136)	-.073 [-.211, .111] (.539)	-.076 [-.461, .238] (.528)
ACS Prosody	-.044 [-1.91, 1.91] (.709)	.013 [-.269, .302] (.909)	.110 [-.235, .641] (.360)	-.078 [-.526, .259] (.501)	-.053 [-.191, .120] (.655)	-.167 [-.350, .059] (.162)	-.112 [-.652, .237] (.352)
ACS Pairs	-.086 [-.765, -.342] (.449)	-.137 [-.159, .038] (.226)	-.084 [-.207, .096] (.467)	-.023 [-.150, .122] (.837)	.087 [-.033, .074] (.448)	-.079 [-.096, .046] (.488)	-.116 [-.231, .077] (.322)

*= Significant at $p < .05$

Linear regression model adjusted for age, gender, and years of education.

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Table 4

Domain specific relationships between ACS predictors and FAST outcomes in the **Current MDD** (*n*= 42) group expressed by standardised Beta coefficients. Upper and lower 95% Confidence interval bounds of Beta coefficients are presented in closed brackets, and *p* values are in parentheses.

ACS Predictors	Psychosocial Outcomes						
	FAST total Score	Autonomy	Occupational Functioning	Subjective Cognition	Leisure Time	Financial Issues	Interpersonal relationships
ACS Affect	.096 [-1.66, 2.66] (.640)	.027 [-.454, .515] (.898)	-.149 [-.880, .386] (.433)	.166 [-.260, .696] (.361)	.046 [-.266, .330] (.827)	.183 [-.140, .361] (.377)	.207 [-.345, 1.06] (.903)
ACS Prosody	-.215 [-4.65, 1.41] (.284)	.077 [-.550, .806] (.383)	-.336 [-1.69, .080] (.073)	-.379 [-1.38, -.050] (.036)*	-.064 [-.482, .352] (.753)	.096 [-.267, .434] (.632)	-.097 [-1.23, .742] (.619)
ACS Pairs	-.097 [-1.39, .836] (.617)	-.135 [-.334, .164] (.492)	.145 [-.195, .457] (.419)	-.275 [-.443, .049] (.112)	-.105 [-.294, .113] (.592)	-.179 [-.188, .070] (.359)	-.027 [-.388, .337] (.887

*= Significant at $p < .05$

Linear regression model adjusted for age, gender, and years of education.

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Table 5

Domain specific relationships between ACS predictors and FAST outcomes in the **Remitted MDD** (*n*= 69) group expressed by standardised Beta coefficients. Upper and lower 95% Confidence interval bounds of Beta coefficients are presented in closed brackets, and *p* values are in parentheses.

	Psychosocial Outcomes						
ACS Predictors	FAST total Score	Autonomy	Occupational Functioning	Subjective Cognition	Leisure Time	Financial Issues	Interpersonal relationships
Remitted MDD							
ACS Affect	-.124 [-2.36, .784] (.320)	-.020 [-.346, .296] (.878)	-.063 [-.584, .353] (.624)	-.119 [-.683, .242] (.345)	-.167 [-.288, .067] (.217)	-.091 [-.195, .097] (.508)	-.125 [-.784, .250] (.306)
ACS Prosody	-.322 [-3.73, -.348] (.019)*	-.262 [-.667, .024] (.068)	-.289 [-1.04, -.029] (.038)*	-.294 [-1.04, -.047] (.032)*	-.084 [-.246, .136] (.565)	.011 [-.151, .163] (.941)	-.277 [-1.15, -.033] (.038)*
ACS Pairs	.077 [-.447, .796] (.577)	-.099 [-.170, .084] (.498)	.192 [-.060, .311] (.180)	.216 [-.251, .158] (.126)	-.042 [-.080, .060] (.781)	.034 [-.051, .064] (.826)	-.062 [-.25, .158] (.650)

*= Significant at $p < .05$

Linear regression model adjusted for age, gender, and years of education.

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