

# Bipolar disorder is an illness characterized by financial instability and risky decision-making.

## How can open banking data support existing contexts of caregiving in managing these risks?

### Identifying and addressing privacy concerns regarding the use of financial data from individuals with BD

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### Background

Bipolar disorder (BD) is strongly associated with financial instability [6]. Symptomatic periods in BD often manifest in poor financial decision-making. For example, 70% individuals with BD have reported impulsive spending during hypomania [3]. Problematic financial behaviors during symptomatic periods can lead to serious long-term financial instability, which can severely impact the quality of life for individuals with BD and their care partners. Maintaining financial stability is a critical challenge to ensure the long-term wellbeing for individuals with BD.

However, there remains a knowledge gap regarding how idiosyncratic, context-driven, and illness-specific factors impact financial decision-making in BD. Furthermore, the lack of granular, in-situ assessment methods is a key challenge against developing just-in-time and personalized interventions focusing on financial stability for this population. Given the importance of financial stability for individuals with BD, this remains a serious knowledge gap with broad practical and societal implications.



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### Methods

Given the sensitivity of personal financial data, we initially sought to establish acceptance and privacy concerns regarding the use of financial data as an objective behavioral marker in BD. We conducted an online factorial vignette survey (N=500; US Prolific) to collect data from individuals with BD.

We used a factorial vignette approach to assess level of comfort with a set of hypothetical scenarios. We systematically varied three factors in our vignette experiment to explore differences in comfort across 18 total scenarios involving intervention actors, contexts, and timing.

Factor	Levels
Actors	Clinicians Care partners Banks
Intervention Context	Share spending details Planning & bugeting 48-hour spending restriction
Mood State	During a mood episode During stable mood

We chose to include only third-party actors, opting to exclude self-management as a possibility. Our prior survey deployment [2] demonstrated a high level of comfort when sharing financial data for self-management.

We included a number of explanatory variables to explore relationships between clinical and financial topics. Clinical history variables included bipolar diagnostic subtype (i.e., BD-I, BD-II, etc.), whether the individual had ever been hospitalized, and whether they had a psychiatric advance directive in place. Financial history variables included whether the individual has considered or declared bankruptcy, whether they have asked care partners for help managing finances, their primary financial goal, and if they have used a Buy Now/Pay Later service. We also collected the Big Five Personality Inventory [5] and Consumer Financial Protection Bureau Financial Well-being Scale [1].

We analyzed survey data using multilevel models [4] to account for the vignette experiment's hierarchical structure (vignette items nested within respondents). This approach allowed us to explore differences in vignette ratings within and between participants and scenarios. Our main analysis incorporated random effects with the dependent variable as a continuous measure of a level of comfort on a scale of 0—10.

### Results

The majority of our respondents were female (59.9%), aged 35 - 44 (24.8%), attended at least some university (30.1%), and were employed full-time (41.4%). Respondents had primarily been diagnosed with BD-II (43.3%), with 23% reporting a BD-I diagnosis and 23.8% reporting BD Not Otherwise

Specified. The majority of respondents had received their BD diagnosis when aged 19 to 29 years.

50% of respondents reported having at least one hospitalization in their lifetime, while 8% had created a psychiatric advance directive. 61.5% of respondents had used a Buy Now/Pay Later service. 11.4% of respondents had declared bankruptcy and 31.7% had considered it as a possibility.

- Respondents were most comfortable when **care partners were involved in financial interventions**, rather than banks or clinicians
- Respondents were least comfortable with a hypothetical **48-hour spending restriction**
- The presence of a **prior bankruptcy or a psychiatric advance directive** were associated with higher comfort levels in 48-hour spending restrictions, especially during mood episodes

The following table provides descriptive statistics for all vignette ratings.

Actors	Intervention Context	Mood State	Mean	Median	SD
Banks	48h Spending Restriction	During Episode	2.74	2.00	2.96
Banks	48h Spending Restriction	Stable Mood	1.81	0.00	2.54
Banks	Planning & Budgeting	During Episode	3.81	4.00	3.20
Banks	Planning & Budgeting	Stable Mood	4.26	4.00	3.18
Banks	Share Spending	During Episode	2.88	2.00	2.96
Banks	Share Spending	Stable Mood	3.16	2.00	3.03
Care Partners	48h Spending Restriction	During Episode	4.58	5.00	3.22
Care Partners	48h Spending Restriction	Stable Mood	2.98	2.00	2.98
Care Partners	Planning & Budgeting	During Episode	5.95	6.00	2.96
Care Partners	Planning & Budgeting	Stable Mood	5.94	6.00	2.94
Care Partners	Share Spending	During Episode	5.41	6.00	3.06
Care Partners	Share Spending	Stable Mood	5.06	5.00	3.12
Clinicians	48h Spending Restriction	During Episode	3.74	4.00	3.10
Clinicians	48h Spending Restriction	Stable Mood	2.58	2.00	2.81
Clinicians	Planning & Budgeting	During Episode	5.40	6.00	3.00
Clinicians	Planning & Budgeting	Stable Mood	5.29	6.00	3.03
Clinicians	Share Spending	During Episode	5.03	6.00	3.12
Clinicians	Share Spending	Stable Mood	4.63	5.00	3.08

### Future Work

1. Demonstrate feasibility and acceptance of collecting financial data from individuals with BD, simultaneously creating a retrospective dataset of mood state and spending (N=60)
2. Assess whether and how such data might be viable as an objective behavioral marker of illness state using machine learning approaches
3. Incorporate findings from this survey along with semi-structured interviews into supportive digital intervention prototypes

### References

[1] Measuring financial well-being: A guide to using the CFPB Financial Well-Being Scale. Retrieved August 30, 2022 from <https://www.consumerfinance.gov/data-research/research-reports/financial-well-being-scale/>

[2] J Brozena, Johnna Blair, Thomas Richardson, Mark Matthews, Dahlia Mukherjee, Erika F H Saunders, and Saeed Abdullah, 2024. Supportive Fintech for Individuals with Bipolar Disorder: Financial Data Sharing Preferences to Support Longitudinal Care Management. (2024).

[3] Kathryn Fletcher, Gordon Parker, Amelia Paterson, and Howe Synnott. 2013. High-risk behaviour in hypomanic states. *Journal of Affective Disorders* 150, 1 (August 2013), 50–56. <https://doi.org/10.1016/j.jad.2013.02.018>

[4] Andrew Gelman and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*.

[5] Beatrice Rammstedt and Oliver P. John. 2007. Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of Research in Personality* 41, 1 (February 2007), 203–212. <https://doi.org/10.1016/j.jrp.2006.02.001>

[6] Thomas Richardson, Megan Jansen, and Chris Fitch. 2018. Financial difficulties in bipolar disorder part 1: Longitudinal relationships with mental health. *Journal of Mental Health* 27, 6 (December 2018), 595–601. <https://doi.org/10.1080/09638237.2018.1521920>

