Differences in Sexual Identity Dimensions between Bisexual and Other Sexual Minority Individuals: Implications for Minority Stress and Mental Health

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1   **Differences in Sexual Identity Dimensions between Bisexual and Other Sexual Minority**

2   **Individuals: Implications for Minority Stress and Mental Health**

3

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Abstract

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2   Bisexual individuals experience poorer mental health than other sexual minority

3   individuals. One explanation for this is that biphobia predisposes bisexual individuals to have a

4   more ambiguous sexual identity and fewer opportunities for stress-ameliorating forms of coping

5   and support. This study explores sexual identity and sexual identity dimensions—prominence,

6   valence, integration, and complexity—in bisexual and other sexual minority individuals. We

7   describe differences in sexual identity dimensions between bisexual and other sexual minority

8   individuals and test two explanations for mental health disparities between them: whether sexual

9   identity dimensions directly impact mental health and whether they moderate the impact of stress

10   on mental health. Data came from a longitudinal study of a diverse sample of sexual minority

11   individuals ($N = 396$, 71 bisexual respondents) sampled from community venues in New York

12   City. Sexual identity was prominent for both bisexual and other sexual minority individuals, but

13   bisexual individuals reported lower valence and integration of sexual identity in their identity

14   structures. The hypothesis that sexual identity dimensions moderate the impact of minority stress

15   on mental health was not supported. Following several longitudinal assessments, however, we

16   concluded that identity valence (but not integration or complexity) and depressive symptoms

17   were bi-directionally associated so that differences in valence between bisexual and other sexual

18   minority individuals explained, in part, disparities in depressive symptoms.

19

20   **Keywords:** *Sexual identity, Minority stress, Bisexuality, Mental health, Depressive symptoms*

21   **Public significance statement:** This study suggests that bisexual individuals differ from other

22   sexual minority individuals in notable ways. Bisexual individuals thought less positively about

1   their sexual orientation and their sexual orientation was less well integrated with other parts of

2   their identity. Furthermore, the fact that bisexual individuals thought less positive about their

3   sexual orientation than other sexual minority individuals partly explained mental health

4   disparities between these groups.

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Sexual Identity Dimensions between Bisexual and Other Sexual Minority Individuals:

Implications for Minority Stress and Mental Health

Research has consistently shown that sexual minority individuals experience worse mental health outcomes than heterosexual individuals (Institute of Medicine, 2011). This research has typically combined sexual minority respondents into one group, obscuring differences within the group. Yet, studies that assessed bisexual individuals separately from other sexual minority individuals have shown that bisexual individuals have a comparatively higher risk for mental health problems such as suicidality (Marshal et al., 2011), depressive symptoms (Ross et al., 2017), and other mood and anxiety disorders (Bostwick, Boyd, Hughes, & McCabe, 2010). Minority stress theory explains health disparities as related to prejudice and stigma, which predispose sexual minority individuals to excess stress that may lead to adverse health (Meyer, 2003). Social identity and identity structures potentially impact mental health, but studies on the relationship between sexual identity structures and mental health among sexual minority individuals remain scarce (Kertzner, Meyer, Frost, & Stirratt, 2009; Major & O'Brien, 2005; Meyer, 2003).

We seek to add to the literature on identity and minority stress by assessing whether differences in sexual identity explain disparities in mental health outcomes between bisexual and other sexual minority individuals. This study is novel in assessing how bisexual individuals differ from other sexual minority individuals on a range of sexual identity dimensions and in analyzing how sexual identity dimensions are related to mental health. A cross-sectional analysis of data from the same dataset used in this study found that identity valence was related to mental health disparities between bisexual and other sexual minority individuals (Kertzner et al., 2009).

1   Here we examine two hypotheses for explaining mental health disparities between bisexual and

2   other sexual minority individuals. First, we assess whether bisexual individuals differ from other

3   sexual minority individuals in identity dimensions, and if so, whether differences in identity

4   dimensions explain observed mental health disparities. Second, we test whether dimensions of

5   sexual identity moderate the impact of stress on mental health and well-being (Meyer, 2003, p.

6   678). For example, that a minority stressor would have a greater impact on health outcomes

7   when sexual identity is prominent than when it is secondary to a person's self-definition.

8   **Characteristics of a Bisexual Identity**

9   Research on the particularities of a bisexual identity can be classified in four broad

10   themes (Sarno & Wright, 2013). First, bisexual individuals may be subject to biphobia both

11   from outside and within the LGBT community (Roberts, Horne, & Hoyt, 2015; Rust, 2002).

12   Examples of biphobia include its devaluation by the attitude that bisexuality is not a valid sexual

13   identity and that it is a transitory stage in the development of a lesbian or gay identity (Brewster

14   & Moradi, 2010; Hequembourg & Brallier, 2009). Second, bisexual individuals conceal their

15   sexual identity more than lesbian women and gay men (Balsam & Mohr, 2007; Durso & Meyer,

16   2013; Mohr, Jackson, & Sheets, 2017). Concealment is a minority stressor that may increase risk

17   for mental health problems (Meyer, 2003; Riggle, Rostosky, Black, & Rosenkrantz, 2017).

18   Third, in part because of biphobia within the LGBT community, bisexual individuals are less

19   connected with the community than other sexual minority individuals (Balsam & Mohr, 2007),

20   which may deprive them of resources and opportunities for coping and social support (Kwon,

21   2013; Meyer, 2015). And fourth, bisexual individuals may have a somewhat more ambivalent

22   stance towards their sexual identity than other sexual minority individuals, like lesbian women

1 and gay men. They report higher levels of internalized homonegativity (Cox, Berghe, Dewaele,

2 & Vincke, 2010; Kuyper & Fokkema, 2011), identity confusion (defined as uncertainty about

3 one's sexual identity), lower levels of identity centrality (defined as the importance of sexual

4 identity for one's overall sense of self) (Balsam & Mohr, 2007; Dyar, Feinstein, & London,

5 2015), and greater variability in their sexual identity over time (Dyar et al., 2015; Galupo,

6 Ramirez, & Pulice-Farrow, 2017; Weinberg, Williams, & Pryor, 1994).

7 **Sexual Identity Dimensions**

8   Sexual identity dimensions—for example, whether identity is viewed positively or

9 negatively by a sexual minority person—may be important for understanding the impact of stress

10 on health outcomes (Meyer, 2003). Sexual identities, like other social identities, have multiple

11 dimensions that are interconnected in identity hierarchies (Ashmore, Deaux, & McLaughlin-

12 Volpe, 2004; Roccas & Brewer, 2002; Rosenberg & Gara, 1985; Stirratt, Meyer, Ouellette, &

13 Gara, 2008). Four dimensions have been discussed, sometimes using different terms: *Identity*

14 *prominence* - also referred to as *identity centrality* or *identity importance* - addresses the

15 importance of a sexual identity within one's identity hierarchy (Ashmore et al., 2004). *Identity*

16 *valence*—or *private regard*—refers to the extent to which an identity is positively or negatively

17 evaluated by an individual (Ashmore et al., 2004). *Identity integration* represents the degree to

18 which a person's sexual identity shows close relationships to other identities in the person's

19 identity hierarchy, or the extent to which multiple identities are perceived to share the same

20 characteristics. *Identity complexity,* lastly, refers to the extent of cohesiveness versus

21 differentiation within one's self-concept, or the extent to which multiple identities are conceived

22 as a single convergent social identity (Roccas & Brewer, 2002; Stirratt et al., 2008). Identity

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integration and complexity are related yet distinct concepts: Identity integration is concerned

with the overlap in characteristics between several social identities; identity complexity taps the

extent to which several identities converge to represent one higher-level social identity.

As discussed above, research has suggested that bisexual individuals are more ambivalent

and less positive about their sexual identity than other sexual minority individuals (in particular

lesbian women and gay men). Based on these observations, we test whether, *compared with*

other sexual minority individuals, the sexual identities of bisexual individuals would be

characterized by lower identity prominence, valence, and integration, and higher identity

complexity (H1).

Sexual Identity as a Predictor of Adverse Mental Health

We also examine the direct impact of sexual identity dimensions on mental health and

assess whether differences between bisexual and other sexual minority individuals in identity

dimensions might explain mental health disparities between the groups. Research provides

mixed results on the association between *identity prominence* and mental health. On the one

hand, it has been argued that strong identification with a minority group might have detrimental

consequences for the well-being of minority individuals, making minority individuals prone to

view themselves as victims of discrimination (Major & O'Brien, 2005). On the other hand,

models of sexual identity development describe identity centrality as a positive component of the

development of a sexual minority identity, for instance leading to lower levels of internalized

homonegativity (Mohr & Kendra, 2011).

In terms of *identity valence*, negatively valued identity has been associated with

depression and other negative mental health outcomes (Allen, Woolfolk, Gara, & Apter, 1996;

Hughes, Kiecolt, Keith, & Demo, 2015). Traditional models of gay identity development have highlighted this component, showing that positive self-evaluations are signs of positive identity development, conducive for mental health (Cass, 1984; Troiden, 1989). For example, an earlier paper, using the same data used in our study, reported a positive cross-sectional association between identity valence and both psychological and social well-being (Kertzner et al., 2009).

Traditional gay identity development models describe the association between identity integration and mental health (Cass, 1984; Troiden, 1989). These models view the integration of sexual minority identity with a person's other identities as the final and optimal stage of sexual identity development, which, in turn, are related to high levels of self-acceptance and emotional well-being (Meyer, 2003). Empirical studies supported this claim, finding that high levels of identity integration were related with positive mental health for sexual minority individuals (Levitt et al., 2016).

Using a similar rationale, *identity complexity* may reflect the presence of incongruent self-concepts and may be associatied with negative mental health outcomes. Furthermore, the maintenance of complex, diverse, and perhaps conflicting identities could create interpersonal strains and increased demands for an individual's time and attention (Simmel & Wolff, 1964; Stirratt et al., 2008).

Modern critics of gay identity development models have pointed out that the models err by describing identity development as a linear progression as well as for focusing on sexual identity as a primary identity rather than considering sexual identity at the intersection of other identities (Eliason & Schope, 2007). These critiques complicate what we can learn from gay identity development models but do not contradict the ideas examined here: that a positive and integrated identity, and a less complex identity structure, are associated with positive mental

health. Based on these writings, we expect identity valence and identity integration to positively

impact mental health and identity complexity to negatively impact mental health.

We thus assess whether identitiy dimensions are associated with a bisexual identity so

that bisexuals will show a more negative sexual identity valence, less identity integration, and

greater complexity than other sexual minority individuals, which, in turn, would explain mental

health disparities between the groups. We hypothesize *that lower mental health in bisexual*

compared with other sexual minority individuals is mediated by differences in identity valence,

integration, and complexity (H2).

Sexual Identity Dimensions as Moderator of the Impact of Stress on Mental Health

In addition, it has been argued within the minority stress framework that qualities of

sexual identity dimensions might moderate the impact of minority stressors on mental health

(Meyer, 2003). Here, identity dimensions can be thought of as the context for the experience of

minority stress. For example, when a stressful experience occurs (e.g., anti-LGB violence), a

person who views her or his sexual identity negatively may experience a sense of dejection,

identifying with the aggressor in rejecting her or his own sexual minority identity, magnifying

the impact of the assault. In contrast, a person who viewed her or his identity positively may

garner resilience and be better ready to initiate support, which, in turn, would ameliorate the

negative impact of the stressful experience (Meyer, 2003). In line with this, research on ethnic

minorities has shown that favorable evaluations of one's minority racial identity in the face of

discrimination functions as a coping mechanism against negative societal opinions of people's

social group (Ellemers & Haslam, 2012; Hughes et al., 2015).

1   Another identity dimension, *identity prominence,* may work to increase vulnerability to

2   minority stressors. Thus, minority stressors that threaten the person's prominent sexual minority

3   identity may have a greater negative impact on his or her mental health as compared with a

4   person who suffers similar stress but for whom the minority identity is less prominent (Thoits,

5   1991). For example, a lesser identity prominence might better allow the person to cope with the

6   minority stressor through disengagement (Major & O'Brien, 2005). We hypothesize that *sexual*

7   *identity dimensions moderate the association between minority stressors and mental health (H3).*

8   **Method**

9   **Sample and Procedure**

10   Data came from project STRIDE, a study on the relationships between identity, stress,

11   and mental health in a diverse LGB sample from New York City. Participants were sampled

12   from venues selected to ensure a wide diversity of cultural, political, ethnic, and sexual

13   representations. Recruitment venues included bars, nonbar commercial establishments, outdoor

14   venues (e.g., parks), groups (e.g., Latin dance clubs), and events (e.g., gay pride). During

15   recruitment, quotas were maintained to ensure that no one venue type/time was overrepresented

16   by more than 3 participants in the final sample. At the venues, the research workers engaged

17   potential respondents in a brief conversation to explain the purpose of the study and asked them

18   to fill out a brief screening form that would determine eligibility for participation in the study.

19   Respondents were eligible if they were 18–59 years old, resided in New York City for 2 years or

20   more, self-identified as lesbian, gay, bisexual, or similar terms (e.g., queer); were male or female

21   (and their gender identity matched sex at birth); and White, African American, or Latino (or

1   defined themselves using similar terms, e.g., Black). Eligible respondents were contacted by an

2   interviewer and invited to complete the in-person research interview at the research office or at

3   another convenient private space. Baseline data were collected between February 2004 and

4   January 2005 ($N = 396$) and wave 2 data were collected 12 months later ($N = 371$), resulting in a

5   94% retention rate. Respondents were compensated $80 for participation in the baseline

6   interview and $60 for participation at wave 2. Sample characteristics and differences between

7   bisexual and other respondents are displayed in Table 1. Bisexual respondents included more

8   women, more race/ethnic minorities, and they were less educated, more often in debt, yet less

9   often unemployed.

10   **Measures**

11   **Sexual orientation.**

12   ***Bisexual identity status*** was measured at wave 1 by asking respondents what best

13   described their sexual orientation. Individuals who indicated *bisexual* as their sexual identity

14   were categorized as bisexual here ($n = 71$). Participants who chose *gay*, *lesbian*, or other labels

15   indicating a sexual minority status (e.g., *queer*, *homosexual*) were included in a general *other*

16   *sexual minority* category ($n = 325$), which was used as reference to the bisexual participants. The

17   large majority of respondents in this reference category identified as gay ($n = 178$), lesbian ($n =$

18   111), or homosexual ($n = 16$); 15 respondents identified as queer, and 5 respondents used other

19   terms to describe their sexual identity. Sexual identity was measured again at wave 2. As a

20   robustness check, we reran our analyses, this time counting all respondents that identified as

1 bisexual at either wave 1 or wave 2, as bisexual. The results (available upon request) did not

2 change from the results reported here.

3 Furthermore, we compared bisexual respondents to a broad reference category of other

4 sexual minorities, rather than separating the group by gender (e.g., lesbian women and gay men).

5 This was done because our goal was to assess how bisexual men and women compare with

6 others within the LGB population in terms of sexual identity. Whereas lesbians and gay men

7 might differ from each other in various ways, both groups differ in similar ways from bisexuals,

8 in that both lesbians and gay men are romantically and sexually attracted to others of one gender,

9 which is the contrast of interest in our study. To assess this, we compared lesbian women and

10 gay men in our sample on mental health and sexual identity (results available upon request).

11 Lesbian women and gay men do not differ significantly in any of the sexual identity dimensions.

12 They also did not differ much in mental health, except that lesbian women had higher level of

13 depressive symptoms. This finding is in line with evidence that women experience more

14 depression than men (e.g., Nolen-Hoeksema, 2001), and thus likely attributable to gender

15 differences rather than to a difference between having a lesbian or gay identity.

16 **Identity.**

17 *Sexual identity dimensions* measured at both wave 1 and wave 2 were used in our

18 analyses. They were calculated on the basis of responses to an Assessment of Multiple Identities

19 (AMI). Participants reported up to 12 personal, relational, and collective identities in response to

20 the question, ''Who am I?'' (Kuhn & McPartland, 1954). Among these 12 identities, participants

21 were asked to specify their gender, racial/ethnic, and sexual identities. While participants were

22 asked to enter an identity term describing these areas, they could enter the specific identity term

they preferred (e.g., homosexual, bisexual, queer). Following the elicitation of identities,

participants rated each identity on a set of 70 descriptive attributes, which were derived from the

five-factor model of personality (Costa & McCrae, 1992). The attribute list included terms such

as *talented*, *guilty*, *unhappy*, *attractive*, and *dependable*, and participants indicated whether each

attribute *does not apply* (0), *applies to some extent* (1), or *applies to a great extent* (2) to an

identity.

Dimensions of sexual identity were derived from the above AMI inventory, by

conducting a Hierarchical Classes Analysis (HICLAS; De Boeck & Rosenberg, 1988). HICLAS

software (De Boeck & Rosenberg, 1988) was used to analyze the identities and identity attribute

ratings provided by the participants. Previous research suggests that the 70-item attribute list is a

valid alternative to the free-response format for rating identities to which the HICLAS-software

was originally applied (Gara, Woolfolk, & Allen, 2002). A free-response format for rating

identities would have taken hours to complete and thus was not optimal for administration as part

of this study (Rosenberg & Gara, 1985).

The software follows an iterative process of differentiation to identify clusters of

identities and their corresponding attributes. Each level of differentiation is termed a "Rank." At

the lowest level of differentiation (Rank 1), all identities and attributes are combined into a

single, unified cluster. Each successive increase in Rank breaks the identities and attributes into

increasingly differentiated and hierarchical sets of clusters. The dimensions reported here

employ HICLAS results at Rank 4, which has previously demonstrated consistently high levels

of goodness-of-fit (>.80) and good psychometric properties for the modeling of identity

interrelationships (Allen et al., 1996; Woolfolk, Gara, & Ambrose, 1999).

1   *Prominence* refers to the location of sexual orientation within the Rank 4 HICLAS model

2 of identity interrelationships. Sexual orientation could be positioned at different tiers within the

3 model, depending on the degree to which it is elaborated by attributes. Identities characterized

4 by a greater number of attributes were located at higher tiers within the hierarchical model. The

5 prominence of sexual orientation was coded 0 (indicating that the target identity was dropped

6 from the model) to 4 (indicating that the identity was at the highest possible level within the

7 model).

8   *Valence* was defined as the proportion of positive attributes from the attributes

9 respondents chose used to describe their sexual identity.

10   *Integration* was defined as the degree to which a target identity showed overlap with

11 other identities within the identity model (that is, they shared precisely the same attributes).

12 Integration was defined as a proportion, calculated as the number of identities that showed

13 overlap with a target identity divided by the total number of identities respondents used to

14 describe themselves.

15   *Global self-complexity* was defined as the total number of identity and attribute clusters

16 within the identity model. Identity models may contain a highly complex structure with many

17 clusters, or a simpler structure with fewer clusters. Complexity could range from 1 (a single

18 attribute cluster) to 70 (70 individual and separate attributes), but a Rank 4 HICLAS commonly

19 produces 5 to 15 attribute clusters (Woolfolk et al., 1999).

20   **Minority stressors.**

21   ***Outness to family*** was measured on a 4-point scale: *out to all*, *out to most*, *out to some*,

22 *out to none*. We used outness to family (rather than friends, co-workers, or health workers) as a

23 proxy for stress related to concealment (Meyer, 2003).

1   ***Chronic strain*** was measured using 28 items referring to sources of strain from 9 areas of

2   life: general or ambient problems, financial issues, work, relationships, parenting, family, social

3   life, residence, and health (Wheaton, 1999) (wave 1 α = .73; wave 2 α = .72). On a scale of 1-3,

4   respondents were asked to indicate whether statements such as "You're trying to take on too

5   many things at once" were *not true*, *somewhat true*, or *very true* for them at the time of the

6   interview.

7   ***Everyday discrimination*** was assessed using the Williams scale (1997). The 8-item scale

8   assessed how often these experiences occurred over respondents' lifetimes on a 4-point scale (1

9   = *often* through 4 = *never*): treated with less courtesy, less respect, and receiving poorer service

10   than others, as well as being threatened or harassed, called names or insulted. It showed good

11   reliability (wave 1 α = .84; wave 2 α = .85). We modified the scale to ask, for each item,

12   whether it was related to sexual orientation, gender, ethnicity, race, age, religion, physical

13   appearance, income level/social class, or some other form of discrimination. We used the total

14   number of instances of discrimination related to sexual orientation.

15   ***Internalized homophobia*** was measured using an 8-item scale, adapted by Frost and

16   Meyer (2009) from Martin and Dean (1992). Items include statements such as "How often have

17   you wished you weren't gay?" Response options ranged from 1 = *often* to 4 = *never*. The scale

18   had good reliability (wave 1 α = .86; wave 2 α = .85).

19   ***Stigma*** was measured using a scale that assessed expectations of rejection and

20   discrimination based on one's sexual minority identity (adapted from Link, 1987). Items included

21   for example, "Most people would willingly accept someone like me as a close friend". Participants

22   responded to a 6-item measure that utilized a 4-point scale ranging from (1) *agree strongly* to (4)

1   *disagree strongly*. The measure was internally consistent (wave 1 α = .88; wave 2 α = .88).

2   Responses were coded so that higher scores reflected more stigma.

3   ***Prejudiced events.*** This measure was adapted from the Structured Event Probe and

4   Narrative Rating scale (Dohrenwend, Raphael, Schwartz, Stueve, & Skodol, 1993). Assessment

5   at step 1 was conducted by the interviewer, who recorded narratives of each life event that

6   happened to the respondent. At step 2, each narrative was coded by two independent raters on

7   several dimensions (e.g., magnitude) including whether or not prejudice was involved. To assess

8   reliability, we evaluated the consistency between the raters. Of all possible event ratings (N =

9   77,085), only 2% were discrepant, indicating a high degree of reliability. Inconsistent ratings

10   were evaluated in a consensus meeting among 3 or more raters (for more on this measure, see

11   Kman, Palmetto, & Frost, 2006). The variable used in this study was calculated as the total

12   number of life events that were classified as involving prejudice.

13   **Mental health indicators.**

14   Both wave 1 and wave 2 mental health indicators were used in the analyses.

15   ***Depressive symptoms*** were measured using the Center for Epidemiological Studies

16   Depression scale (CES-D; Radloff, 1977). The CES-D is a 20-item self-report measure on

17   depressive symptoms experienced over a 1-week period prior to the interview. The scale showed

18   high internal consistency in this sample (wave 1 α = .92; wave 2 α = .91).

19   ***Psychological well-being*** was measured using an 18-item self-administered assessment

20   (Ryff & Keyes, 1995). This measure assesses psychological well-being across six domains: self-

21   acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and

22   personal growth. The internal consistency of the scale was sufficient (wave 1 α = .75; wave 2 α

23   = .77).

1   ***Social well-being*** was measured using a 15-item self-administered assessment (Keyes,

2   1998). The construct examines respondents' perception of their social environment and includes

3   five dimensions of social well-being in this regard: social coherence, social integration,

4   acceptance, contribution, and actualization. Internal consistency of the scale was sufficient (wave

5   1 α = .78; wave 2 α = .75).

6   **Control variables.**

7   We used the wave 1 measurements of our control variables. *Education* was

8   operationalized as a dichotomous variable that distinguished participants who had obtained less

9   than or equal to a high school diploma from the rest of the sample. We created an *unemployment*

10   category, defined as non-student individuals who were seeking work. We assessed net worth by

11   asking participants to calculate how much money they would have or owe after converting all

12   assets to cash and paying all debts (Conger et al., 2002). Responses were then coded into a

13   dichotomous net worth variable, with 1 indicating *negative net worth*. Furthermore, respondents

14   were classified in three *age categories*: 18–29 years of age, 30–44, and 45–59. These categories

15   approximate periods of post adolescent entry into and exploration of the LGB community; the

16   subsequent and greater assumption of social roles related to partnership, child-care

17   responsibilities, work, or community activities in young adulthood; and the deepening or

18   broadening commitment of these roles in midlife, particularly as they relate to the wellbeing of

19   future generations. *Gender.* Respondents were either male or female. No transgender respondents

20   were included in the sample. *Ethnicity.* Respondents were part of one of three ethnic groups:

21   White/Caucasian, Black/African American, or Hispanic/Latinx.

1   **Analysis Plan**

2   A schematic overview of our analyses can be found in Figure 1. First, we tested whether

3   bisexual respondents differed from other sexual minority respondents in terms of sexual identity

4   dimensions. To ascertain the stability of our findings, both wave 1 and wave 2 sexual identity

5   dimensions were regressed on sexual identity status.

6   Using path analysis, we consequently examined whether sexual identity dimensions had

7   direct associations with mental health (path 2a, Figure 1) estimating paths between each of four

8   sexual identity dimensions and each of three mental health outcomes. We then tested whether a

9   bisexual identity status was indirectly associated with mental health via sexual identity

10   dimensions (paths 1 and 2a, Figure 1). Inference regarding the statistical significance of indirect

11   effects was based on 95% bias-corrected confidence intervals (95% BC CI) of the specific paths

12   using non-parametric bootstrap analyses (Preacher & Hayes, 2008) with 4,000 bootstrapped

13   resamples of size = n. Bootstrap analyses were preferred over other methods for inference on the

14   indirect effects, as bootstrapping is robust against non-normality of the sampling distribution of

15   the indirect effect (Montoya & Hayes, 2016). We estimated both cross-sectional and longitudinal

16   models. Baseline data were used in the cross-sectional analyses. In the longitudinal models, we

17   estimated the effect of baseline sexual identity dimensions on mental health measured at wave 2,

18   controlling for mental health measured at wave 1. Models were estimated using Full Information

19   Maximum Likelihood (FIML) in order to compensate for missing data (Allison, 2003). Item

20   missingness was low, ranging between 0% (most wave 1 measures) and 7.6% (psychological

21   well-being wave 2). We allowed for correlated errors between sexual identity dimension and

22   between mental health measures, thereby acknowledging potential inter-correlation amongst

18

1   sexual identity dimensions and mental health measures respectively. In all analyses, we

2   controlled for education, unemployment, negative net worth, age, gender, and ethnicity.

3   We then tested associations between sexual identity and mental health. In path 2b

4   (Figure 1), we tested whether dimensions of sexual identity functioned as effect moderators of

5   the association between minority stressors and mental health by running OLS regressions. Both

6   cross-sectional (using baseline data) and longitudinal models were estimated. In the longitudinal

7   models, we regressed mental health at wave 2 on minority stressors at wave 2, sexual identity

8   dimensions at baseline, and the interaction between minority stressors and sexual identity

9   dimensions, controlling for mental health at baseline. Three mental health indicators were

10 analyzed as outcomes: social well-being, psychological well-being, and depressive symptoms.

11 This resulted in testing a total of 6 * 3 = 18 possible interaction effects per sexual identity

12 dimension. The large number of tests conducted necessitated the usage of a multiple test

13 procedure so that the False Discovery Rate (FDR) was controlled. The FDR refers to the rate of

14 significant findings that are actually null findings (Storey & Tibshirani, 2003). To this end, p-

15 values of the interaction effects were transformed into q-values, using the method of Benjamini

16 and Hochberg (1995). Q-values were calculated per set of 18 parameter estimates of the

17 interaction effects of each sexual identity dimension. Only parameter estimates with a $q<.05$

18 were interpreted as significant, leading to an expected value of 5% for the FDR (Benjamini &

19 Hochberg, 1995; Storey & Tibshirani, 2003).

Results

Minority Stress and Mental Health of Bisexual Individuals Compared with Other Sexual

Minority Individuals

4   Compared with other sexual minority respondents, fewer bisexual women and men were

5 out to all their family members, and they had higher levels of internalized homophobia (Table 1).

6 Bisexual respondents experienced less discrimination and fewer prejudice events compared with

7 other respondents. At wave 1, bisexual respondents had lower social well-being than other sexual

8 minority respondents; at wave 2, they had lower social and psychological well-being and more

9 depressive symptoms than other sexual minority respondents (Table 1).

10 **Identity Dimensions in Bisexual Respondents**

11   Table 1 also shows that, at both wave 1 and wave 2, bisexual and other sexual minority

12 respondents rated their sexual identities as important, with no differences in identity prominence

13 between the groups. However, in both waves, bisexual individuals had lower identity valence,

14 meaning they viewed their bisexual identity less positively than other sexual minority

15 individuals. Bisexual respondents also had lower identity integration, showing that their bisexual

16 identity was less integrated with their other personal and social identities in comparison to the

17 other sexual minority respondents in our study. AT wave 2, bisexual respondents also had

18 higher identity structure complexity, meaning that they had comparatively less integrated identity

19 hierarchy structures, which consisted of more clusters (similar differences in identity complexity

20 were found at wave 1, yet these were not statistically significant).

Direct Effect of Identity Dimensions on Mental Health

In cross-sectional and longitudinal models, we assessed whether identity valence and identity integration were positively related to mental health, and whether self-complexity was negatively related to mental health. Results of the cross-sectional path analysis are depicted in Figure 2 (all path coefficients for both the cross-sectional and longitudinal path analysis can be found in Appendix A). The model fitted the data well ($\chi^2(20) = 17.4$, $p = .625$; $RMSEA = .000$, 90% CI [.000, .037]; $CFI = 1.000$). Results were consistent across the three mental health outcomes: higher identity valence was related to better mental health, whereas higher identity complexity was related to poorer mental health. The longitudinal model (Figure 3) fitted the data well too ($\chi^2(26) = 28.2$, $p = .349$; $RMSEA = .015$, 90% CI [.000, .043]; $CFI = 0.998$) but only the effect of identity valence on depressive symptoms was significant.

Identity Dimensions as a Mediator of Mental Health disparities between Bisexual and Other Sexual Minority Individuals

Bootstrap analyses on the cross-sectional path model showed indirect effects of bisexual identity on social well-being ($\beta = -.07$, 95% BC CI [-0.14, -0.03]), psychological well-being ($\beta = -.09$, 95% BC CI [-0.17, -0.03]), and depressive symptoms ($\beta = .06$, 95% BC CI [0.02, 0.11]), running via identity valence. These results show that lower valence of sexual identity explains, in part, bisexual individuals' lower mental health (Figure 2). Longitudinal analyses showed a significant indirect path from bisexual identity status to depressive symptoms via identity valence ($\beta = .03$, 95% BC CI [0.003, 0.066]) but the results for psychological and social well-being were not significant in the longitudinal analysis.

1   To understand the findings regarding well-being we assessed variability in well-being

2   over the one year follow-up. Results from the longitudinal path analysis showed that both social

3   well-being and psychological well-being were relatively stable over time (stability coefficients: β

4   = .51, p<.01, 95% CI [.43, .60]; β = .61, p<.01, 95% CI [.53, .70], respectively) compared with

5   depressive symptoms (stability coefficient: β = .33, p<.01, 95% CI [.23, .43]), leaving little

6   variation in social and psychological well-being to be explained by sexual identity dimensions.

7   To further probe the relationships between valence and depressive symptoms, we

8   assessed the possibility of reversed causation by estimating a cross-lagged model (Figure 4).

9   Results point to bi-directional effects: an effect of valence (at wave 1) on depressive symptoms

10   at wave 2 (β = -.11, p<.05, 95% CI [-.21, -.02]), but also an effect of depressive symptoms at

11   wave 1 on valence at wave 2 (β = -.21, p<.01, 95% CI [.32, .49]). The path coefficients of

12   depressive symptoms on valence and valence on depressive symptoms were not significantly

13   different from each other ($\chi^2(1)$ = 1.8, p =.18).

14   **Interaction Effect of Identity Dimensions on the Relationships Between Stress and Mental**

15   **Health**

16   We tested the hypothesis that sexual identity dimensions moderated the association

17   between minority stressors and mental health by assessing whether sexual identity dimensions

18   measured at baseline moderated any of 144 possible associations between minority stressors and

19   mental health at baseline (4 identity dimensions times 18 possible moderations) and at wave 2 (4

20   identity dimensions times 18 possible moderations). Only one interaction was statistically

21   significant at $q < .05$ (identity complexity increased the impact of discriminatory events on

1   depressive symptoms at baseline). Therefore we conclude that our results do not support the

2   moderation hypothesis in this study.

3   **Discussion**

4   Consistent with literature on health disparities, we found that bisexual individuals had

5   poorer social and psychological well-being and more depressive symptoms than other sexual

6   minority individuals. We assessed how bisexual individuals differed from other sexual minority

7   individuals in terms of sexual identity dimensions and whether these differences explained health

8   disparities between these groups. We found that sexual identity was prominent for both groups of

9   respondents, but bisexual respondents reported lower valence and integration. In turn, identity

10   valence had a significant impact on depressive symptoms, and differences in valence between

11   bisexual and other sexual minority individuals partially explained disparities in depressive

12   symptoms between the groups. The hypothesis that sexual identity dimensions moderate the

13   impact of minority stress on mental health was not supported.

14   The findings are significant for showing the impact of identity on depressive symptoms

15   and for beginning to explain disparities among sexual minority subgroups. The use of an

16   extensive and flexible identity measure, which allowed each respondent to use her or his

17   preferred identity term as a referent, is especially significant. Typically, studies of sexual

18   minority individuals, including measures of identity, make little distinctions among subgroups,

19   potentially missing important divergences (Balsam & Mohr, 2007; Dyar et al., 2015).

20   That identity valence is the only dimension that proved robust in our various assessments

21   is interesting, if not surprising—identity valence has been discussed as an important aspect of

22   identity development for decades now (Cass, 1984)—but work on bisexual identity development

23

1   is lagging (Eliason & Schope, 2007). Our work does not inform about the causes of lower

2   identity valence and integration among bisexual individuals, but some hypotheses can be offered.

3   Structural constraints are significant and include greater stigma related to bisexuality, fewer role

4   models, and fewer resources in the LGBT community. All of these may leave bisexuals

5   individuals less able than other sexual minority individuals to counter social biphobia and adopt

6   positive bisexual identities (Roberts et al., 2015; Rust, 2002).

7   Our findings underscore the importance of longitudinal analyses for assessing the

8   directionality of associations. Whereas our cross-sectional analyses suggested that both identity

9   complexity and valence were substantially related to mental health, only a bi-directional

10   association between valence and depressive symptoms was preserved when analyzing these

11   associations over time. This suggests that results from cross-sectional research might overstate

12   the impact of social identity on mental health.

13   This study is novel for being the first to investigate whether sexual identity moderated the

14   association between minority stress and mental health. Although this was suggested in the

15   theoretical paper that introduced the minority stress framework (Meyer, 2003), it has not yet

16   been empirically tested. As this is the first study to test this hypothesis, which was not supported

17   here, our results should be considered with some caution. Future researchers ought to test this

18   intriguing hypothesis, for example, using measures of other types of stressors than the mostly

19   distal stressors we tested.

20   **Limitations and Suggestions for Future Research**

21   Several limitations are notable. First, the data were collected a little over ten years ago.

22   To the extent that bisexual identity is now more positively held by bisexual people, our findings

23   may be biased. However, we have no reason to believe that significant social changes in the

24

status of bisexuality and in how bisexual identity is viewed have occurred, as observers continue

to note that bisexual identity is stigmatized both within and outside the LGBT community

(Dodge et al., 2012), and bisexual individuals continue to evidence lower mental health when

compared with other sexual minority individuals. This is perhaps most clearly portrayed in a

recently published meta-analysis by Ross and colleagues (2017), who summarized health

disparities between bisexual and lesbian or gay individuals of studies using data collected

between the 1990's and 2014. Health disparities between the bisexual and lesbian/gay group in

studies using collected data collected in 2010 or later appeared to be at least as large as

disparities reported in studies using data from before 2010 (see Ross et al., 2017, Figure 2,

authors' calculations). Similarly, since our data were collected, there has been an expansion of

available labels for people with a non-binary sexual orientation (e.g., *pansexual*). The

implications of our findings to other identity labels remain to be explored. However, despite the

expansion of labels, bisexuality remains an important category. Furthermore, studies on

individuals with plurisexual identities have shown that people with bisexual and other labels

often show many commonalities in terms of sexual identity (Galupo et al., 2017).

A second limitation of this study is that, although we used a diverse sample of sexual

minority individuals, it was recruited from sources in the LGBT community in New York City,

raising concerns about generalizability. For example, connection to the LGBT community was

probably higher in this sample than in the general population of bisexual individuals who are less

connected to the LGBT community. This might have attenuated the differences we could find

between bisexual and other sexual minority individuals. Studies that use probability sampling

would be insightful to understanding how bisexual individuals who are not connected with the

LGBT community might differ.

Conclusions

Despite these limitations, this study is important for showing that bisexual individuals stand apart as a distinct subgroup within the population of sexual minority individuals. Bisexual Americans comprise about half of the sexual minority population (Gates, 2011), but they receive little specialized attention in research and policy analysis. Researchers, policy makers, and public health workers ought to pay greater attention to understanding and addressing the issues that impact bisexual health. Further research could help in developing services and support specific to bisexual individuals and assess what interventions may improve bisexual identity valence. As our study suggests, improvement in valuation of bisexual identity may lead to improved mental health among bisexual individuals.

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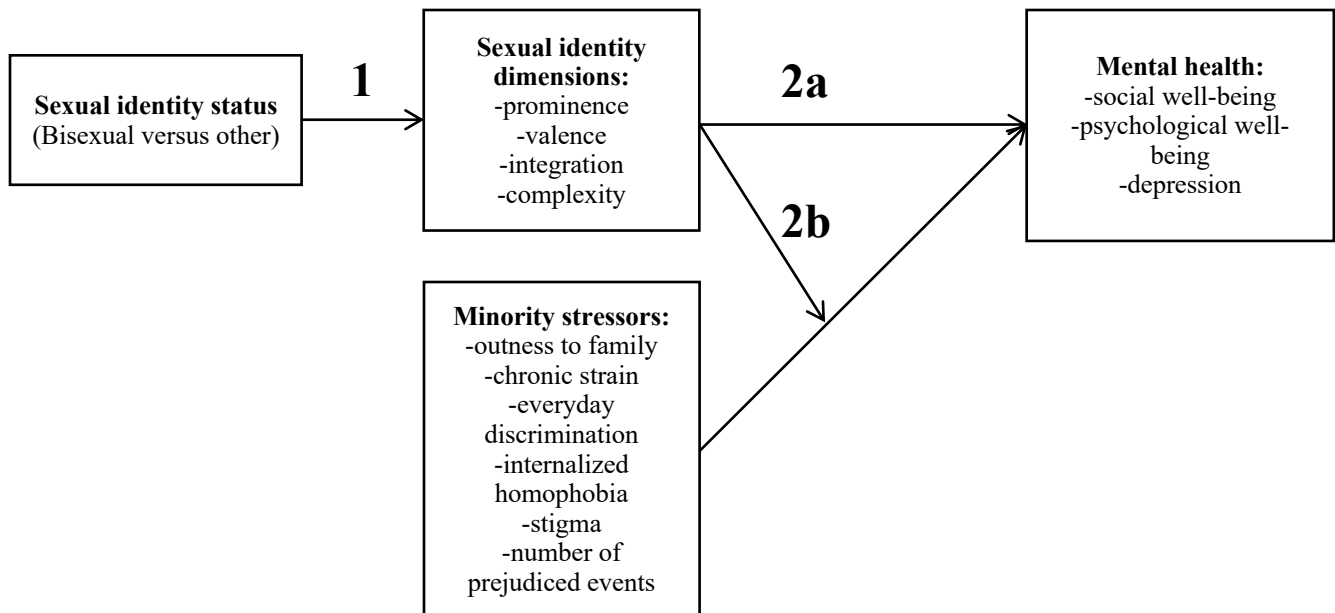13   depression. *Journal of Nervous & Mental Disease*, *187*(7), 393–399.
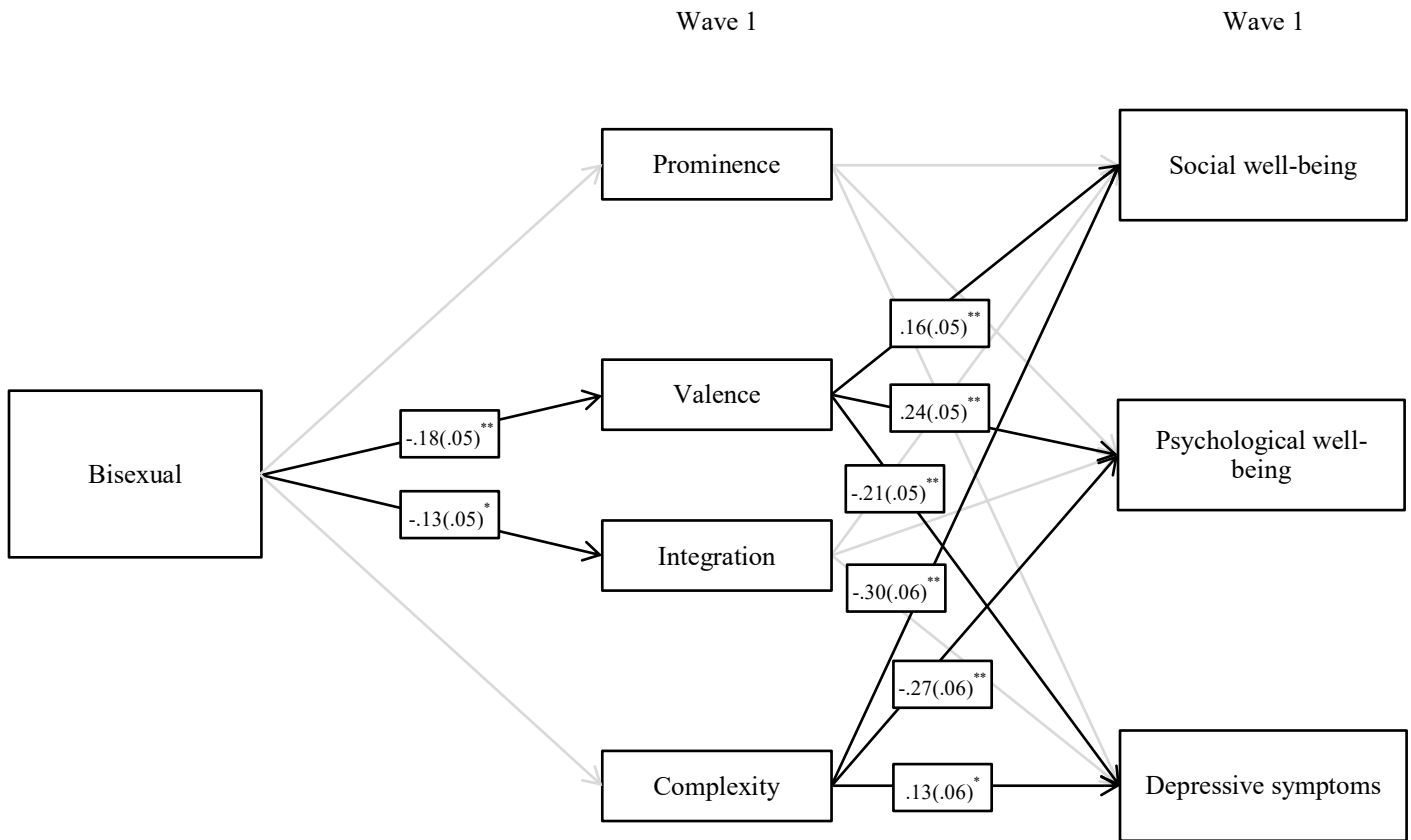
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Figure 1. Schematic overview of analyses

Wave 1   Wave 1

Prominence

Social well-being

Bisexual

-.18(.05)**

Valence

.16(.05)**

.24(.05)**

Psychological well-being

-.21(.05)**

-.13(.05)*

Integration

-.30(.06)**

-.27(.06)**

Complexity

.13(.06)*

Depressive symptoms

Figure 2. Summary of cross-sectional path analysis
Notes: 1. * $p < 0.05$, ** $p < 0.01$, two-sided.
2. Standardized effects. SE between parentheses. Significant effects in black, non-significant effects in gray.
3. Additional controls: education, unemployment, negative net worth, age, gender, and ethnicity.
4. Method = FIML, $N = 396$. $\chi^2(20) = 17.4$, $p = .625$; $RMSEA = .000$, 90% CI [.000, .037]; $CFI = 1.000$.
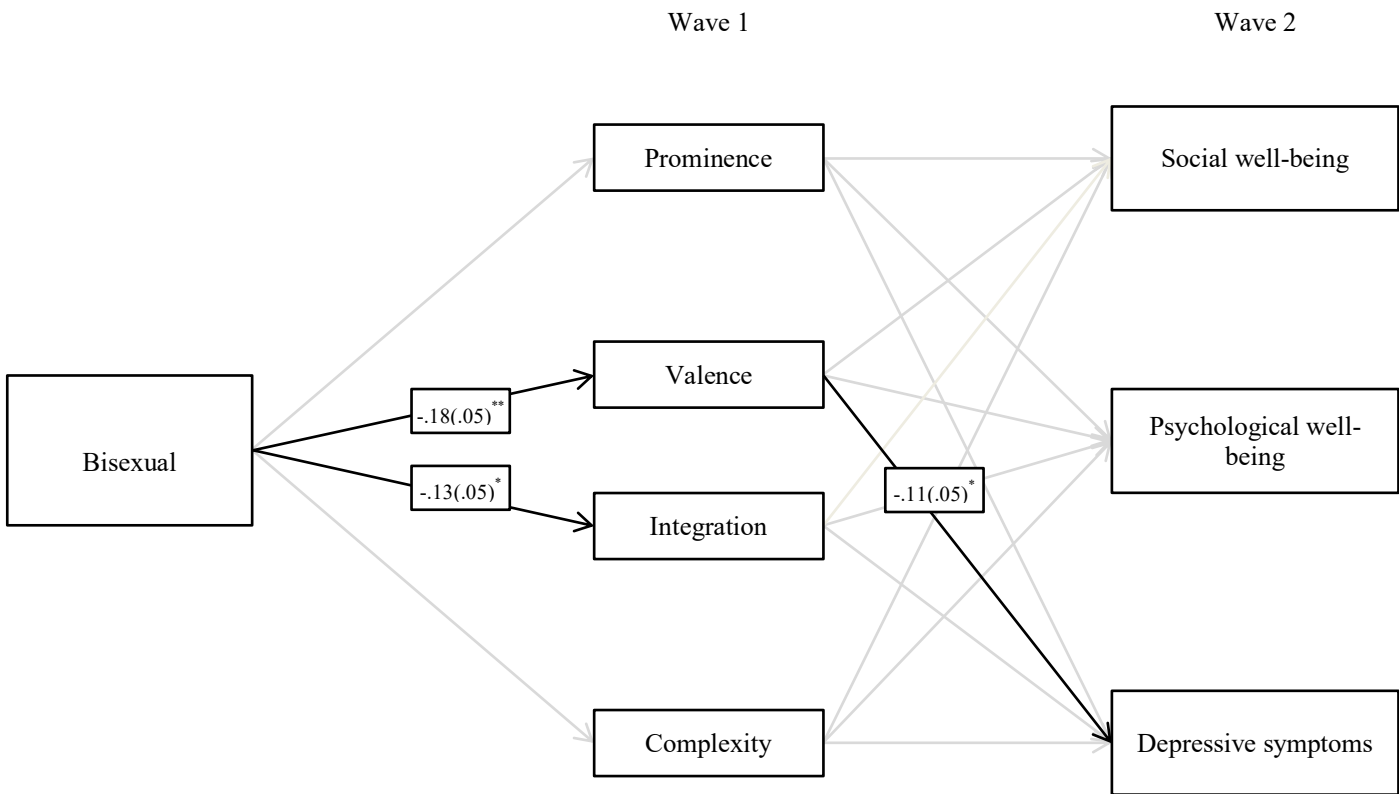
Figure 3. Summary of longitudinal path analysis
Notes: 1. * $p < 0.05$, ** $p < 0.01$, two-sided.
2. Standardized effects. SE between parentheses. Significant effects in black, non-significant effects in gray
3. Additional controls: education, unemployment, negative net worth, age, gender, and ethnicity
4. Method = FIML, $N = 396$. $\chi^2(26) = 28.2$, $p = .349$; $RMSEA = .015$, 90% CI [.000, .043]; $CFI = 0.998$.
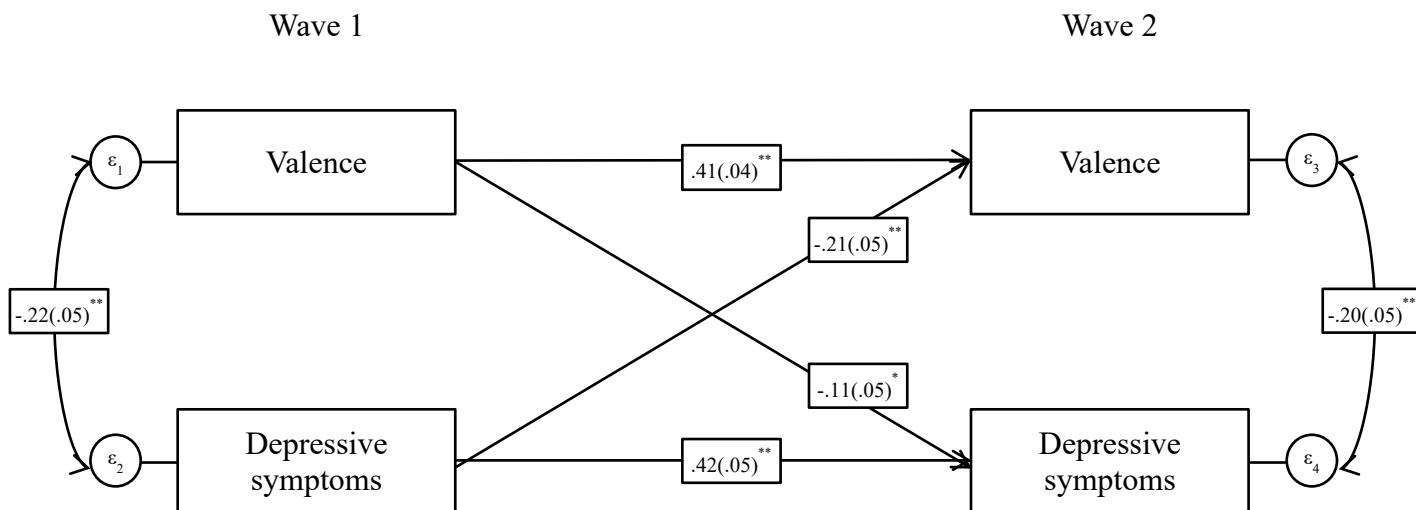
Figure 4. Cross-lagged path analysis valence and depressive symptoms

Notes: 1. [*] $p < 0.05$, [**] $p < 0.01$, two-sided.
2. Standardized effects. SE between parentheses.
3. Controlled for effects of education, unemployment, negative net worth, age, gender, ethnicity.
and sexual orientation on Wave 1 and Wave 2 valence and depressive symptoms.
4. Method = FIML, $N = 396$. $\chi^2(0) = 0$; *RMSEA* = .000; *CFI* = 1.000 (fully identified model).