

**The Moderating Role of Psychological Flexibility in the Relationship Between
Loneliness and Well-being Among Young Adults:
A Cross-sectional Study**

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Abstract

Loneliness is considered a universal constant; an experience one cannot easily escape from. Despite the evidence of its deleterious effects on mental and physical health across all age groups, the majority of research has primarily focused on older cohorts, leaving young adults beyond the scope of scientific attention. The current study aims to compensate for this research inequity by examining whether there is an indication that psychological flexibility protects individuals against the negative effects of loneliness on well-being. It was hypothesized that the inverse relationship between loneliness and well-being would be significantly less pronounced among young adults with high, compared to low, psychological flexibility. The design of the study was cross-sectional. For the purpose of this research, 162 participants, between 18 and 30 years of age, were recruited through social media. Data were collected online via self-reported psychological assessments of loneliness (Loneliness Scale), psychological flexibility (FIT-24) and well-being (SF-12) and were subsequently analyzed using linear regression analysis. According to the results, the two-way interaction between loneliness and psychological flexibility was not significantly associated with well-being ($p = .45$). The disconfirmation of the research hypothesis was attributed to the use of an unsuitable moderator and methodological shortcomings. Clinical and research implications include the documentation of the actual effects of psychological flexibility on well-being, which will be accomplished within longitudinal experimental designs, and the investigation of other moderating variables, including social engagement and emotion regulation styles. The research stands out in terms of novelty and cultural diversity, but could be improved in terms of methodology. Overall, despite the statistical insignificance that was observed, findings highlight the profound need to reduce the distress that may derive from loneliness.

Keywords: loneliness; moderation; psychological flexibility; well-being; young adults

Loneliness is an integral part of the human experience (Bhagchandani, 2017) and, by extension, an ongoing life threat. Taking into account its detrimental effects on mental and physical health, the need to protect our well-being by alleviating loneliness is, therefore, rendered urgent and imperative.

Within the scientific field, loneliness is considered a fundamental psychological construct (Chue, 2010). Contrary to the generally held notion, loneliness neither coincides nor is directly connected to objective social isolation (de Jong Gierveld et al., 2006; West et al., 1986). In fact, among various definitions that have been employed across the literature, the most prevalent is suggested by Peplau and Perlman (1982) who defined *loneliness* as a painful emotional experience occurring when a person's social network is qualitatively or quantitatively deficient. An equally accepted definition, published by the same authors, describes loneliness as a discrepancy between the amount of desired and actual social contacts (Peplau & Perlman, 1982). Evidently, there is a mutual consensus across scholars that social deficiency is the cornerstone of loneliness (Chue, 2010). Consistent with this line of research is Weis's (1973) conceptualization of loneliness as a relational deficit. In particular, Weis (1973) operationalizes loneliness as a two-dimensional construct, which consolidates into two distinct patterns. Each pattern is related to different social deficiencies. *Emotional loneliness* stems from the absence of an intimate tie with an attachment figure (such as a partner, a parent or a child) and encompasses feelings of emptiness and abandonment, whereas *social loneliness* stems from the absence of a wider social network of peers with whom one shares common interests and activities (such as friends, colleagues or neighbors). Weis's conceptualization has been supported by various studies showing that social and emotional loneliness complement but also diverge from each other (Chiao et al., 2019; Diehl et al., 2018).

Loneliness has progressively gained well-deserved scientific attention. So far, however, only little of this attention has been given to the experience of loneliness among young adults (Diehl et al., 2018) owing to its physical and emotional implications which may be more severe for older adults (Chue, 2010). Within this context, several studies have demonstrated that loneliness intensifies with age (Hawkley & Cacioppo, 2007), hence implying that its general upward trend cannot be easily disputed. Be that as it may, Luhman and Hawkley (2016) advocate that loneliness is not evenly distributed across the age range and therefore cannot be restricted to

old people. Indeed, research suggests that loneliness tends to follow a non-linear, U-shaped distribution across the lifespan, with elevated levels during early (< 30) and late adulthood (65+) (Luhmann & Hawkley, 2016; Moksnes et al., 2021; Victor & Yang, 2012). Thus, loneliness penetrates all stages of the life course in various degrees (Green et al., 2001) and it is important to explore its negative impact among young adults as well, in order to have an integrative picture of the experience of loneliness. Loneliness is also worth of investigation due to the significant role that social networks play within young adulthood. In line with the popular view of people being less lonely in the presence of a significant number of friends (Luhmann & Hawkley, 2016), scattered research has shown that young adults may sometimes value the quantity rather than the quality of their relationships (Victor & Yang, 2012), which might eventually explain the relative prevalence of social -as opposed to emotional- loneliness during emerging adulthood. In that sense, the size of embedded networks constitutes a predictor (Green et al., 2001), as well as an endless source of protection against social loneliness (Luhmann & Hawkley, 2016; Victor & Yang, 2012). The various developmental challenges that adolescents encounter in their transition to adulthood may also account for loneliness. In particular, it is assumed that emerging adults may ultimately become vulnerable to loneliness as they struggle to balance their need for independence with their need for intimacy. Thus, it is of primary importance to identify psychological resources that may alleviate the symptoms of loneliness.

A renowned psychological resource that has recently gained scientific attention can be identified within the theoretical framework of Acceptance and Commitment Therapy (ACT); a representative of the third wave of Cognitive-Behavioral Therapy which aspires to broaden one's behavioral repertoire and increase commitment to valued action (Gregoire et al., 2020). ACT's principles are aligned with Relational Frame Theory (RFT). Rather than focusing directly on the content of internal psychological events, RFT focuses on the relationship that a person develops with his cognitions and emotions as well as on their functionality (Hayes et al., 2006). ACT's ultimate aim is meaningful life (Hayes et al., 2006). To accomplish that, psychological flexibility; the underlying mechanism of action, needs to be cultivated. Within ACT, *psychological flexibility (PF)* is defined as an adaptive response style, which captures the human tendency to approach internal states in a non-judgmental, mindful way, while being consistent with one's values (Hayes et al., 2006; Kashdan & Rottenberg, 2010). Psychologically flexible individuals are not overly preoccupied with uncomfortable feelings of distress. On the contrary, they are

willing to tolerate them in order to engage in action that facilitates meaningful goal pursuit (Kashdan et al., 2020; Twiselton et al., 2020). PF encompasses two key components; mindfulness and acceptance and commitment and behavioral change. These components can be subsequently divided into six inter-related psychological processes, namely, acceptance, cognitive defusion, contact with the present moment, self as context, values and committed action. Each process is regarded as a positive psychological skill (Hayes et al., 2006), whereas PF on the whole is considered an ability that can be gradually increased.

The body of evidence that indicates the effectiveness of ACT is increasingly growing (Hayes et al., 2006). Mindfulness interventions, in particular, hold good promise, since they have been found effective in terms of fostering interpersonal relationships and reducing feelings of loneliness (Lindsay et al., 2019). Surprisingly, though, to our knowledge there has been no direct link in the existing literature between loneliness and PF among young adults. Admittedly, this link would have been crucial. Not only would it improve our understanding of the specific mechanisms that can potentially mitigate loneliness, but it would also contribute to the development of interventions that target those mechanisms with the aim of boosting resilience and helping vulnerable individuals reconcile with loneliness. Remarkably, since PF decreases with age (Boman et al., 2017), it is speculated that young adults, due to their malleable and curious nature, may be more receptive, compared to older adults, to techniques that equip them with acceptance and cultivate valued action, which will eventually help them not immerse in loneliness as they grow up.

On the other hand, the relationships of loneliness and PF separately with well-being have been systematically reviewed. The bottom line of studies focusing on the relationship between PF and well-being is that PF is a central aspect of individual well-being and adaptive functioning (Gregoire et al., 2020; Kashdan et al., 2020), also among college students. Bi and Li (2021), for instance, showed that PF is significantly associated with adjustment to student life. In addition, in Gregoire's et al. (2020) research, college students reported higher levels of well-being after participating in an ACT intervention, which suggests, as Hayes et al. (2006) maintain, that only "levels of PF are impacting subsequent mental health, and not the reverse" (p. 13).

The research that focuses on loneliness and well-being reveals an inverse relationship between clusters of loneliness and various dimensions of well-being, including mental and

physical health. This is exemplified by research conducted by Bhagchandani (2017), Chiao et al. (2019), Chue (2010) and Moksnes et al. (2021). Despite the abundance of scientific evidence illustrating the significant negative association between loneliness and poor health, however, there is currently no solid indication of causality, meaning that their relationship might be reciprocal (Chiao et al., 2019, de Jong Gierveld et al., 2006).

Finally, the relationship between all three variables, namely, loneliness, psychological flexibility and well-being (mental and physical) unfortunately remains understudied and therefore needs to be originally addressed. The current study aims to fill this gap in literature, by examining whether there is an indication that PF protects against the negative effects of loneliness on well-being among young adults. Apparently, there is no clear-cut answer to this research question. However, according to de Jong Gierveld et al. (2006), the relationship of loneliness with well-being can be moderated by an external variable. On the grounds of PF's multifaceted and dynamic nature (Doorley et al., 2020) and young adults' plasticity, it is assumed that PF might represent such a moderator; predisposing young adults to profit from PF and subsequently alleviate their distress. Within this context, our research hypothesis is that the negative relationship between loneliness and well-being is significantly less pronounced among young adults with high (compared to low) levels of PF (H1). The effect of PF on the relationship between loneliness and well-being will be further investigated through the lens of its sub-processes (mindfulness and acceptance or commitment and behavioral change) (RQ1). Last but not least, it will be explored whether the effect of PF on the relationship between loneliness and well-being depends on the type of loneliness (emotional or social) (RQ2).

Method

Procedure

The study was approved by the Ethical Review Board of the faculty of Social and Behavioral Sciences of Utrecht University (FETC21-1948). The design of the study was cross-sectional and observational. Data were collected online, via self-reported measurements of loneliness, psychological flexibility and well-being (mental and physical). All scales were administered through a secure website of Utrecht University (Qualtrics Survey) and were part of a battery of questionnaires investigating, among others, personality, emotion expressivity, attachment, loss and life satisfaction. Prior to filling in the questionnaire, participants were

informed about the survey's context via a detailed description of its aim, as well as its confidential and voluntary nature. Participants who agreed on the terms and conditions of the survey and met the criteria of completion (were 18 years of age or older), gave their informed consent and were, subsequently, allowed to submit their answers. For most people, the completion of the questionnaire lasted 15 to 30 minutes.

Participants

The present study focused solely on young adults, between 18 and 30 years of age. Participants were recruited through social media networking platforms, such as Facebook and Whats App. The aim was to gather at least 15 participants for each of the seven measuring variables. Thus, at least 105 participants were required in total. The sampling method employed was convenience. Participant's country of origin was not a matter of concern. In fact, cultural diversity was desired. Only completed assessments of loneliness, psychological flexibility and well-being were considered valid and, subsequently, used in the survey.

Materials

Demographics. In total, 8 items were included in the first part of the study. Participants were asked to indicate their sex, educational level, student and marital status, nationality and whether they had a chronic illness.

Loneliness. Loneliness was assessed with the 6-item Loneliness Scale (de Jong Gierveld & van Tilburg, 2006) which consists of two subscales; social (e.g., "There are many people I can trust completely") and emotional loneliness (e.g., "I experience a general sense of emptiness"). Each subscale is represented by 3 items. Participants' answers were rated on a 5-point Likert type scale, ranging from 1 "Certainly" to 5 "Certainly not". Higher scores in the social scale indicate higher degree of social loneliness, whereas higher scores in the emotional scale indicate lower degree of emotional loneliness. To reach an acceptable level of reliability, which was defined as having a Cronbach's $\alpha > .60$, ($\alpha = .62$ in this study), one item had to be deleted from the emotional loneliness subscale ("I miss having people around"). Prior to the deletion of this item, the subscale's reliability was $\alpha = .59$. The item that completed the subscale was "I often feel rejected". The level of reliability for social loneliness was $\alpha = .83$. Total loneliness emerged by calculating the mean of social and emotional loneliness, with the latter being reverse coded.

Higher scores in the scale indicate a higher degree of loneliness. The scale's reliability coefficient was $\alpha = .82$, which is concordant with typical values, ranging between .80 and .90, which were observed in previous studies (de Jong Gierveld & van Tilburg, 1999). Overall, the scale is considered a valid and reliable measuring instrument of social and emotional loneliness (de Jong Gierveld et al., 2006).

Psychological flexibility. For the measurement of PF, the short 24-item version (FIT-24; van Hoek et al., 2021) of the Flexibility Index Test (FIT-60; Batink & Delespaul, 2015) was employed. FIT-24 was forward-and-backward translated from Dutch to English and German. Only eight items were directly used from the English version. The 24 items of FIT-24 are evenly distributed to the six components of PF, which in turn reflect its two underlying factors; mindfulness and acceptance (e.g., "I suffer from a negative self-image") and commitment and behavior change (e.g., "I find my life valuable"). Out of the 24 items, 16 reflect mindfulness and acceptance and the remaining eight, commitment and behavior change. Participants were asked to rate the extent to which each statement applied to their situation on a 7-point Likert type scale, where 0 corresponds to "Totally disagree" and 6 to "Totally agree". Higher scores in the mindfulness and acceptance factor denote lower levels of PF, whereas the opposite applies to commitment and behavioral change. Thus, mindfulness and acceptance scores were reversed. Cronbach's alpha was very good with respect to both factors ($\alpha = .88$ for mindfulness and acceptance and $\alpha = .80$ for commitment and behavior change). In order to calculate total PF, mindfulness and acceptance and commitment and behavior change item scores were added and, subsequently, divided by 24. Higher scores denote higher levels of PF. The scale's internal consistency reached $\alpha = .90$, which is congruent with previous research using the FIT-60 (Koppert et al., 2020).

Well-being. The short form (SF-12; Ware et al., 1996) of the 36-item Health Survey (SF-36; Ware, 2000) was the assessment tool used as an indicator of well-being. Mental and physical health, the two underlying dimensions of well-being, were evaluated via two independent scales; Mental Composite Score (MCS) and Physical Composite Score (PCS). Each scale is subdivided into four subscales. MCS consists of Role-Emotional (RE) -two items, Mental Health (MH) -two items, Vitality (VT) -one item- and Social Functioning (SF)- one item, whereas PCS (consists) of General Health (GH)-one item, Physical Functioning (PF)-two items, Role-Physical (RP)-two

items, and Bodily Pain (BP) -one item. All (12) items were rated on a Likert type scale. However, the rating scale differed between the subscales. Thus, possible answers varied from two to six. Raw scores were transformed to a 0 to 100 scale ($M = 50$, $SD = 10$), with higher scores indicating higher well-being. Four items, namely 1, 8, 9 and 10, had to be reverse coded. Reliability analysis revealed an internal consistency of $\alpha = .75$ for MCS and $\alpha = .67$ for PCS, which were considered acceptable. Well-being was computed by adding the scores from MCS and PCS and dividing them by two. The scale's internal reliability was $\alpha = .73$.

Statistical analysis

Data analyses were conducted through IBM SPSS Statistics 27. All statistical tests were two-tailed, with the level of significance set at .05. Descriptive statistics included the demographics' frequencies (n , %) and the variables' Means (M) and Standard deviations (SD). To evaluate the scales' internal consistency, Cronbach's α was computed. Items contributing to a significant reduction of the subscale's reliability ($\alpha < .60$) were deleted (Ursachi et al., 2015). The univariate associations between loneliness, psychological flexibility and well-being were calculated with Pearson's correlation.

Prior to the linear regression analysis, all assumptions were checked. To test conditional normality, both univariate (x,y space) and bivariate (xy space) outliers were inspected. With respect to univariate outliers, z -scores were obtained by dividing each variable's skewness and kurtosis values with their standard errors (Kim, 2013). With the exception of emotional loneliness, all score distributions were found normal (z -score < 3.29) considering the sample size ($50 < n < 300$). To deal with this single violation of normality, emotional loneliness was dichotomized. Respectively, bivariate outliers were defined as having a Cook's distance > 1 . No bivariate outliers were detected. Multicollinearity was tested with the Variation Inflation Factor (VIF). VIF exceeded 1.000 in all cases. Homoscedasticity was checked by plotting the residuals against the outcome variable. Overall, none of the assumptions was violated.

The moderation effect of psychological flexibility on the relationship between loneliness and well-being was examined with linear regression analysis using the PROCESS macro version 3.5 (Hayes, 2013). The number of bootstrap samples was set to 1000. Continuous variables were centered. In order to determine which demographics should be included in the linear regression analysis, univariate correlations were previously performed of sex and educational level with the

outcome variable (well-being). Educational level was significantly correlated with well-being ($r(160) = .19, p < .05$). However, all participants reported having successfully completed secondary education. The educational level was therefore considered relatively high among all participants and the variable was not included in the final model as a covariate.

Results

Sample description

Fifty-two participants submitted incomplete assessments and were, therefore, excluded from further statistical analysis. Those participants varied in terms of sex (69% were female), student status and nationality, but their level of education was considered high, their marital status was either single or in a relationship (living apart) and most of them did not suffer from a chronic illness. Overall, in terms of absolute percentages, more non-students (44% vs. 33%) and English/Irish participants (33% vs. 12%) dropped out than participated and were therefore under-represented. The final sample consisted of 162 participants between 18 and 30 years of age. Table 1 presents the demographic characteristics of all participants. The vast majority was female, well educated (bachelor and/or master degree), even though still studying, and single. The percentage of people in a relationship (either cohabiting or living apart) was also high. Participants originated from a wide range of cultural backgrounds, with German and Greek/Cypriot being the most prevalent nationalities among them. Only a small number of participants reported having a chronic illness.

Table 1*Demographic characteristics of all participants (N = 162)*

Baseline characteristics	All participants	
	<i>n</i>	%
Gender		
Male	42	25.9
Female	120	74.1
Identity not listed	0	0.0
Prefer not to say	0	0.0
Student		
Yes	108	66.7
No	54	33.3
Educational level		
Less than high school	0	0.0
High school graduate	16	9.9
Professional degree/Apprenticeship	13	8.0
Bachelor/Undergraduate studies	70	43.2
Master	60	37.0
Doctorate	3	1.9
Marital status		
Single	73	45.1
In a relationship (cohabiting)	33	20.4
In a relationship (living apart)	48	29.6
Married	8	4.9
Divorced/Separated	0	0.0
Widowed	0	0.0
Chronic illness		
Yes	12	7.4
No	150	92.6
Nationality		
Dutch	23	14.2
German	50	30.9
English/Irish	19	11.7
Greek/Cypriot	46	28.4
Other	24	14.8

Correlations between loneliness, psychological flexibility and well-being

Means, Standard deviations and correlation coefficients between loneliness, psychological flexibility and well-being are shown in Table 2. Overall, all correlations were significant and, according to Cohen's (1998) conventions, most effect sizes were moderate ($.30 < r < .50$). On the contrary, the associations of total loneliness with PF and mindfulness and acceptance were large ($r > .50$). Similarly, PF and mindfulness and acceptance were individually strongly related to well-being. Finally, as expected, the correlation coefficients of loneliness with its factors as well as PF with its factors were large.

Participants' reported levels of well-being were generally below the neutral mid-point, whereas the opposite applied to loneliness (even though marginally) and psychological flexibility, with the exception of mindfulness and acceptance, which was also marginally below the mid-point.

Table 2

Descriptive statistics and correlation coefficients for loneliness, psychological flexibility and well-being in 162 participants

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. Loneliness (total)	2.35	0.80	-					
2. Emotional loneliness	1.36	0.48	.72**	-				
3. Social loneliness	2.22	0.93	.93**	.53**	-			
4. Psychological flexibility (total)	3.40	0.81	-.56**	-.46**	-.43**	-		
5. Mindfulness and acceptance	2.91	0.99	-.52**	-.45**	-.40**	.96**	-	
6. Commitment and behavior change	4.39	0.78	-.43**	-.31**	-.33**	.70**	.47**	-
7. Well-being	42.68	4.71	-.43**	-.45**	-.33**	.55**	.50**	.48**

** $p < .01$

Moderation effect of psychological flexibility on the association between loneliness and well-being (H1)

The results from the linear regression analysis are presented in Table 3. Overall, the regression model explained 33% of the variance in the outcome variable ($F(3,158) = 25.62, p < .001, R^2 = .33$). Well-being was negatively associated with total loneliness ($t(158) = -2.30, p = .02$) and positively with PF ($t(158) = 5.73, p < .001$), indicating that participants who reported high levels of loneliness reported low levels of well-being, whereas participants who reported high levels of PF also reported high levels of well-being. The two-way interaction between total loneliness and PF was not significantly associated with well-being, while taking into account the main effects ($t(158) = -.76, p = .45$) (Figure 1), indicating that, irrespective of the level of PF, higher levels of loneliness were associated with lower levels of well-being. Since the negative association between total loneliness and well-being was not significantly lower among participants with high, compared to low, PF, H1 was not confirmed.

Table 3

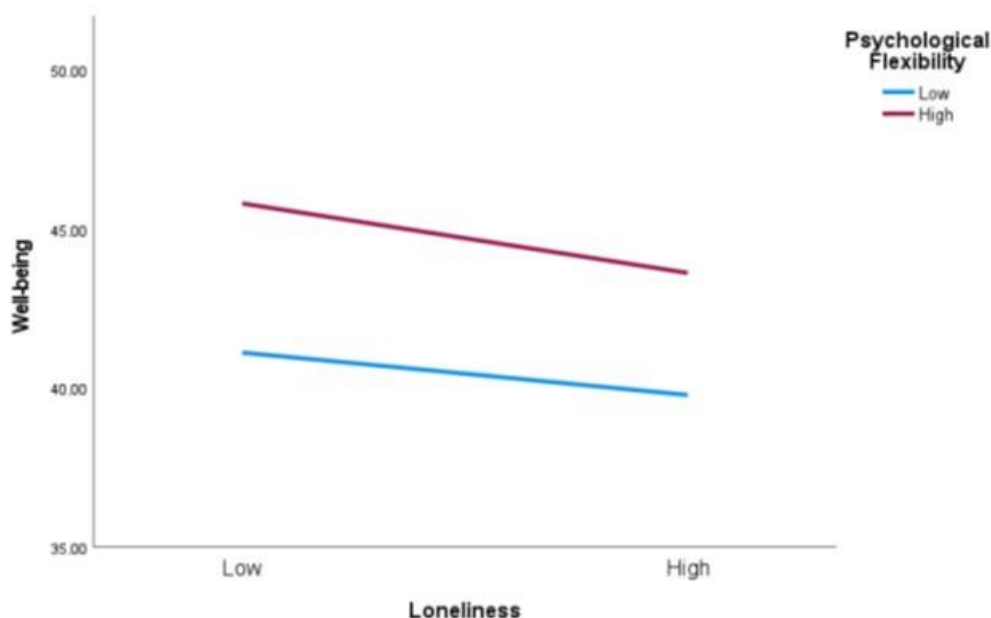
Linear regression analysis of well-being associated with loneliness and psychological flexibility

Effect	Estimate	SE	95% CL		p
			LL	UL	
Constant	42.56	.34	41.88	43.24	<.001
Loneliness (total)	-1.09	.47	-2.03	-.16	.02
Psychological flexibility (total)	2.61	.46	1.71	3.51	<.001
Loneliness (total) x Psychological flexibility (total)	-.33	.43	-1.17	.52	.45

Note. Number of studies = 162. CI = confidence interval; LL = lower limit; UL = upper limit

Figure 1

Well-being in relation to loneliness and psychological flexibility



Note. The figure shows the regression lines for well-being (y axis) as a function of low (-1 *SD*) and high (+1 *SD*) loneliness (x axis), for participants with low (-1 *SD*) and high (+1 *SD*) psychological flexibility. The Standard Error (*SE*) of measurement is $SE = 0.37$ ($SE = SD_{\text{well-being}}/\sqrt{N}$).

Ad hoc analysis 1 (RQ1): Moderation of psychological flexibility factors on the association between loneliness and well-being

All tables and figures related to the ad hoc analyses are presented in the supplementary files. These analyses were conducted in order to clarify whether the insignificant interaction of total loneliness and PF on well-being might be due to separate variables.

The results from the first exploratory analysis are presented in Table 4 and Table 5. Both models -either with mindfulness and acceptance or commitment and behavior change- explained 29% of the variance in the outcome variable ($F(3,158) = 21.71, p < .001, R^2 = .29$; $F(3,158) = 21.28, p < .001, R^2 = .29$, respectively). Mindfulness and acceptance was significantly associated with well-being ($t(158) = 4.71, p < .001$), but the interaction of mindfulness and acceptance with loneliness, while controlling for the main effects, was not. ($t(158) = -1.32, p = .19$) (Figure 2). Likewise, commitment and behavior change was significantly associated with well-being $t(158)$

= 4.80, $p < .001$), but the interaction of commitment and behavior change with loneliness, while controlling for the main effects, was not ($t(158) = .56, p = .57$) (Figure 3). These findings illustrate that participants who presented high levels of PF also presented high levels of well-being. However, neither mindfulness and acceptance nor commitment and behavior change significantly reduced the negative association between loneliness and well-being among participants with high scores on PF.

Ad hoc analysis 2 (RQ2): Moderation of psychological flexibility on the association between emotional or social loneliness and well-being

The results from the second exploratory analysis are presented in Table 6 and Table 7. The model with emotional loneliness explained 37% of the variance in the outcome variable ($F(3,87) = 16.69, p < .001, R^2 = .37$), whereas with social loneliness 32% ($F(3,158) = 24.21, p < .001, R^2 = .32$). The relationship between emotional loneliness and well-being was statistically significant ($t(87) = -2.61, p = .01$), but, when accounting for the main effects, the interaction between emotional loneliness and PF was not significantly associated with well-being ($t(158) = -1.54, p = .13$) (Figure 4). On the contrary, neither social loneliness nor the interaction between social loneliness and PF, while accounting for the main effects, were significantly correlated with well-being ($t(158) = -1.54, p = .13; t(87) = -.84, p = .41$, respectively (Figure 5). Thus, only emotional loneliness was negatively associated with well-being. Moreover, the negative association of loneliness with well-being was not moderated by PF.

Discussion

Aim of the current study was to investigate the relationship between loneliness, psychological flexibility and well-being, by examining specifically whether there are indications that PF protects against the negative effects of loneliness on well-being. Within this context, it was expected that the negative association between loneliness and well-being would be less pronounced among participants with high, compared to low, PF, owing to PF's moderating role.

The results yielded a significant negative association of -total and emotional- loneliness with well-being, validating the well-established inverse relationship between these two variables. Across the literature, loneliness has been repeatedly found to correlate with various dimensions of mental and physical health, including clinical levels of anxiety and depression, poor sleep

quality, low self-esteem, substance abuse and suicidal behavior (Chiao et al., 2019; Diehl et al., 2018; Moksnes et al., 2021). Recent research has even pointed out the predictive value of loneliness, suggesting that loneliness might be a risk factor for low well-being (Bhagchandani, 2017; Hombrados-Mendieta et al., 2013). The research finding that contradicts our scientific knowledge and therefore captures our attention is the non-significant relationship between social loneliness and well-being. Although young adults have been claimed to occasionally prioritize their social over their emotional needs (Green et al., 2001; Victor & Yang, 2012), it must be taken into account that this survey took place during a worldwide health crisis caused by the COVID-19 pandemic. Young adults may have therefore reappraised their personal values and realized the importance of having few close friends rather than a wide social network. This reevaluation of social standards by young adults might have given rise to the acknowledgement that well-being is not a function of the size of one's social network; thus, increasing the threshold for distressing levels of social loneliness, reducing perceived levels of social loneliness and finally contributing to its non-significant association with well-being. COVID-19 might also account for the relatively low mean scores in well-being (Landmann & Rohmann, 2021; Lee et al., 2020) which were observed in this study.

The positive association of PF with well-being was also significant, indicating the fundamental role of PF in promoting health. This finding accords with previous research which has consistently recorded the benefits of PF in improving the quality of life and reducing stress levels (Gregoire et al., 2020; Hayes et al., 2006). Interventions that focus on developing mindfulness and acceptance, in particular, have stood out in terms of effectiveness among college students (Gregoire et al., 2020). Interestingly, in our research both factors of PF were independently associated with well-being. Thus, it seems that young adults are able to maintain a sustainable level of mental and physical health whether they embrace mindfulness and acceptance or commitment and behavior change strategies.

With respect to the main hypothesis (H1), the results showed that PF did not buffer the relationship between loneliness and well-being, indicating that high loneliness correlates with poor health, irrespective of the level of PF. Subsequently, PF's hypothesized additive value in the case of high loneliness was disproved. The moderation was not significant even when both factors of PF (RQ1) and loneliness (RQ2) were examined separately. For the lack of statistical

significance there are several possible explanations. These, however, do not strictly derive from a line of reasoning that is supported by empirical research, since the three-fold relationship between loneliness, PF and well-being has only been rarely addressed to date (Boman et al., 2017; Ortega-Jiménez et al., 2021).

In this context, it must be acknowledged that in this study PF was only measured. Should an ACT intervention preceded health measurements, completely different results might have been observed. Future research should therefore consider employing an experimental design, in which variables are measured in two time points (pre- and post-intervention). Perhaps, this intervention could focus on components of PF which have been reported to be the most relevant to students' adjustment, like valued action (Bi & Li, 2021). Ideally, such interventions should also take into account that PF is a relatively new and multifaceted concept. Therefore, participants may need time and practice to fully grasp the essence of PF (Gregoire et al., 2020) and, in turn, ACT interventions, (as opposed to simple measurements), may be time-consuming.

It might also be the case that the analysis failed to produce significant results due to the use of an unsuitable moderator. Mindfulness and acceptance strategies, in particular, may encourage stagnation to a status of loneliness and inactivity, rather than motivating lonely people to take the necessary steps towards enhancing their mental and physical health. Thus, psychological flexibility might not represent the most effective way to curb the negative effects of loneliness. Nevertheless, other moderators might have produced significant results. Personality characteristics, including social engagement and emotion regulation styles, for instance, could have stronger buffering effects. The number, frequency and type (face-to-face, online) of social contacts as well as social support have also been proposed as possible protective mechanisms (Luhman & Hawkey, 2016). Considering, however, the lack of association between social loneliness and well-being that was observed in this study, the number of friends might have also failed to function as a moderator. Finally, it can be argued that the sample was not big enough for a significant moderation to be detected.

The generalization of the findings is restricted by a number of methodological limitations. First and foremost, the design of the study was cross-sectional. Therefore, conclusions about causality cannot be drawn from the data. Furthermore, the sample size ($N=162$), although deliberately narrowed down to a specific age group (18-30), was relatively

small and the sampling method (convenience), neither purposive nor representative. The self-reported nature of data collection can also be considered a weakness, because participants' answers may have been guided by social desirability, acquiescence and overarching personality traits, such as neuroticism. Likewise, the length of the assessment, consisting of a battery of questionnaires, might have worn out some participants, contributing to a number of random answers. Finally, it is worth mentioning that FIT-24 (van Hoek et al., 2021) is a recently constructed assessment tool. Thus, its psychometric properties, even though strong, have only been indicated by one study (Batink et al., 2012).

On the other hand, the research also exhibited a number of methodological strengths. Among them, the most important is probably the careful scrutiny of loneliness and PF, which was accomplished by documenting each factor's and subfactor's individual relationship with well-being. The exclusive focus on young adults may also be considered a source of power, since there is currently a dearth of compelling evidence regarding the experience of loneliness within this age group (Diehl et al., 2018). Finally, the cultural diversity of the sample allows us, to some extent, to assume the universality of these relational patterns. However, given the small sample size, our conclusions must be tentative.

Overall, the present research attempted to shed some light to the uncharted relationship between loneliness, psychological flexibility and well-being among young adults. The findings, though partly significant, highlight the importance of alleviating the pain that is caused from loneliness. Psychological flexibility may not be eventually the most suitable moderator, but other pathways may exist, through which the ramifications of loneliness can be successfully mitigated. Future clinical and scientific research should focus on specific components of PF or other social and emotional skills in order to disentangle the influence of such constructs on the relationship between loneliness and well-being.

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Supplementary files

Table 4

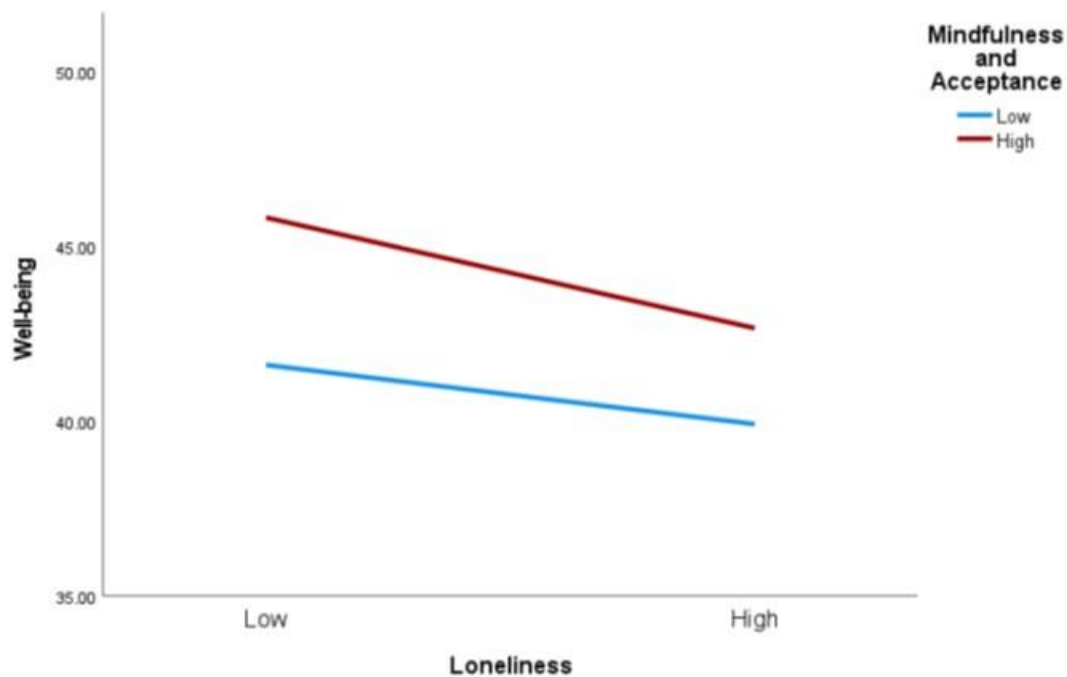
Linear regression analysis of well-being associated with loneliness, mindfulness and acceptance

Effect	Estimate	SE	95% CL		p
			LL	UL	
Constant	42.49	0.35	41.81	43.17	<.001
Loneliness (total)	-1.51	0.47	-2.44	-.58	.002
Mindfulness and acceptance	1.75	0.37	1.02	2.49	<.001
Loneliness x Mindfulness and acceptance	-.46	0.35	-1.15	.23	.19

Note. Number of studies = 162. CI = confidence interval; LL = lower limit; UL = upper limit

Figure 2

Well-being in relation to loneliness and mindfulness and acceptance



Note. The figure shows the regression lines for well-being (y axis) as a function of low (-1 SD) and high (+1 SD) loneliness (x axis), for participants with low (-1 SD) and high (+1 SD) scores on mindfulness and acceptance. The Standard Error (SE) of measurement is $SE = 0.37$ ($SE = SD_{\text{well-being}}/\sqrt{N}$).

Table 5

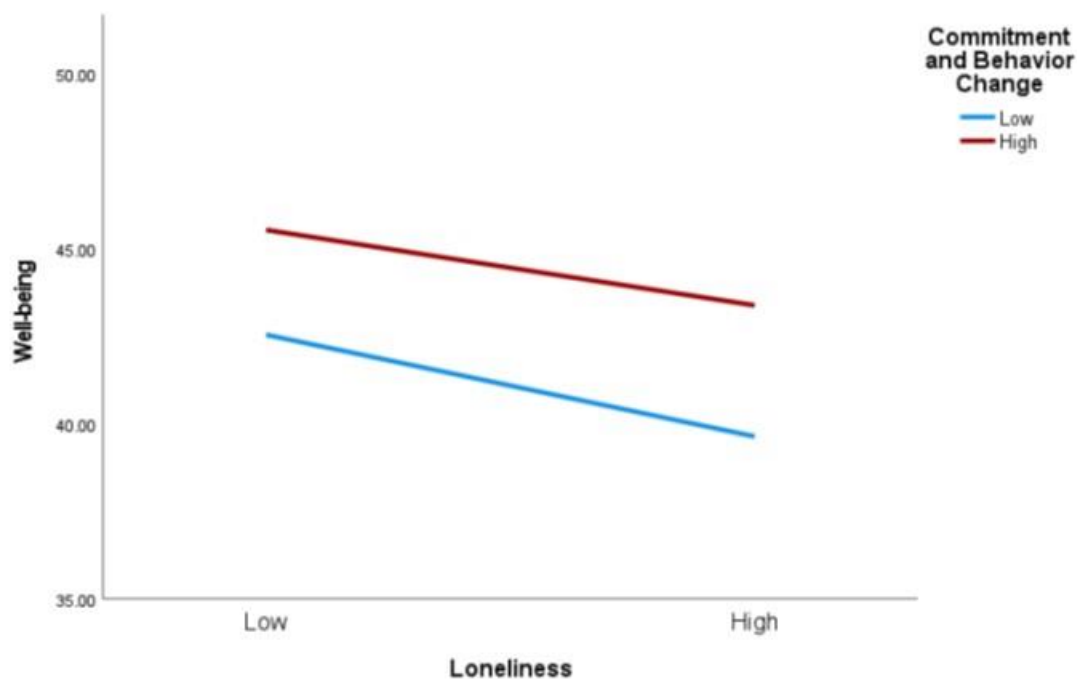
Linear regression analysis of well-being associated with loneliness and commitment and behavior change

Effect	Estimate	SE	95% CL		p
			LL	UL	
Constant	42.76	0.35	42.08	43.44	<.001
Loneliness (total)	-1.57	0.44	-2.43	-.70	<.001
Commitment and behavior change	2.16	0.45	1.27	3.05	<.001
Loneliness x Commitment and behavior change	.30	0.53	-.74	1.34	.57

Note. Number of studies = 162. CI = confidence interval; LL = lower limit; UL = upper limit

Figure 3

Well-being in relation to loneliness and commitment and behavior change



Note. The figure shows the regression lines for well-being (y axis) as a function of low (-1 SD) and high (+1 SD) loneliness (x axis), for participants with low (-1 SD) and high (+1 SD) scores on commitment and behavior change. The Standard Error (SE) of measurement is $SE = 0.37$ ($SE = SD_{\text{well-being}}/\sqrt{N}$).

Table 6

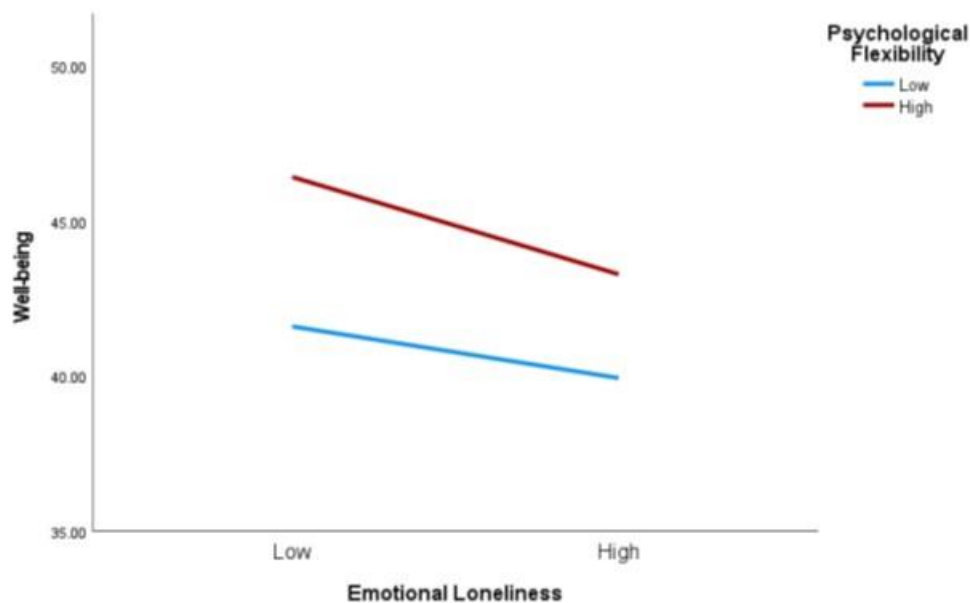
Linear regression analysis of well-being associated with emotional loneliness, social loneliness and psychological flexibility

Effect	Estimate	SE	95% CL		p
			LL	UL	
Constant	46.39	1.30	43.81	48.97	<.001
Emotional Loneliness	-2.40	0.92	-4.22	-.57	.01
Psychological Flexibility (total)	3.96	1.73	.52	7.40	.02
Emotional Loneliness x Psychological Flexibility (total)	-.93	1.11	-3.13	1.28	.41

Note. Number of studies = 162. CI = confidence interval; LL = lower limit; UL = upper limit

Figure 4

Well-being in relation to emotional loneliness and psychological flexibility



Note. The figure shows the regression lines for well-being (y axis) as a function of low (-1 SD) and high (+1 SD) emotional loneliness (x axis), for participants with low (-1 SD) and high (+1 SD) psychological flexibility. The Standard Error (SE) of measurement is $SE = 0.37$ ($SE = SD_{\text{well-being}}/\sqrt{N}$).

Table 7

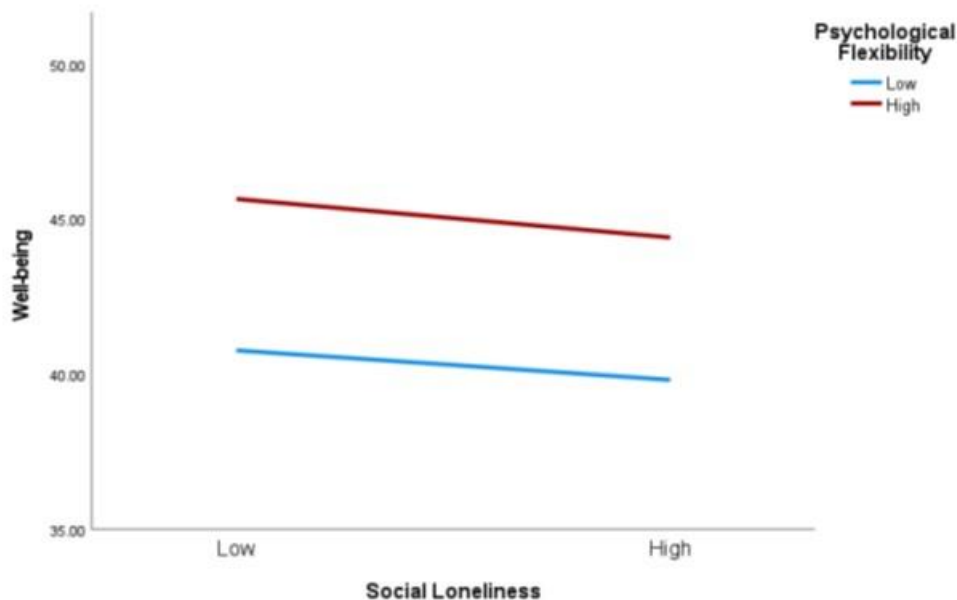
Linear regression analysis of well-being associated with social loneliness and psychological flexibility

Effect	Estimate	SE	95% CL		p
			LL	UL	
Constant	42.65	0.34	41.99	48.97	<.001
Social Loneliness	-.59	0.38	-1.35	.17	.13
Psychological Flexibility (total)	2.90	0.42	2.07	3.73	<.001
Social Loneliness x Psychological Flexibility (total)	-.09	0.40	-.88	.70	.82

Note. Number of studies = 162. CI = confidence interval; LL = lower limit; UL = upper limit

Figure 5

Well-being in relation to social loneliness and psychological flexibility



Note. The figure shows the regression lines for well-being (y axis) as a function of low (-1 SD) and high (+1 SD) social loneliness (x axis), for participants with low (-1 SD) and high (+1 SD) psychological flexibility. The Standard Error (SE) of measurement is $SE = 0.37$ ($SE = SD_{\text{well-being}}/\sqrt{N}$).