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Optimism and pessimism were prospectively associated with adaptation during the COVID-19 pandemic

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ABSTRACT

Using longitudinal data from the Health and Retirement Study, we examined the association between optimism/pessimism before the pandemic and adaptation during the COVID-19 pandemic. Overall, optimism was associated with behaviors that reduce COVID-19 transmission and higher psychological well-being ($\beta s > |.196|$) through changes in social contacts (indirect effect $\beta s > |.004|$) and/or increases in physical activity ($\beta s = |.01|$). Separating optimism and pessimism, we found that only pessimism was associated with behaviors that reduce risk, but *both* optimism and pessimism were associated with psychological well-being. By investigating them in the context of new public health challenges, we found that while the presence of optimism and absence of pessimism may both be resources for well-being, the absence of pessimism may be particularly important for health-relevant behaviors.

The pandemic introduced many behavioral and psychological changes, particularly during its early stages. One thing that helped people cope with enduring and uncontrollable stressors like the pandemic is optimism—holding a positive expectation for the future (Scheier & Carver, 1992). Optimism is associated with better physical and mental health (Colby & Shifren, 2013; Mohammadi et al., 2020). It is a psychosocial resource during hardships, (e.g., natural disasters; Van der Velden et al., 2007) because it motivates people to problem-solve, adapt, and pursue achievable goals (Nes & Segerstrom, 2006; Ramírez-Maestre et al., 2019). During the height of COVID-19, optimism was associated with less COVID-related psychological distress (Chasson et al., 2021; Vos et al., 2021).

However, most studies were cross-sectional, creating ambiguity around whether optimism is associated with better adaptation because optimism may have changed due to the pandemic (Hoeppner et al., 2024). To address this, we tested whether optimism in 2016 was prospectively associated with better adaptation during the pandemic in 2020. Specifically, we examined adaptive (health) behaviors and psychological well-being and whether changes in perceived social support/strain and physical activity explain associations between optimism and psychological well-being. We also evaluated whether optimism and

pessimism had independent associations in this context.

1. Was optimism associated with behaviors that minimize the risk of COVID-19?

In general, dispositional optimism has been considered an asset in times of stress and for maximizing life outcomes like physical health (Carver & Scheier, 2014; James et al., 2019; Purol & Chopik, 2021). It is viewed as a relatively stable trait that is partially heritable, but it can also change over time with experiences and interventions (Chopik et al., 2020; Malouff & Schutte, 2016; Mosing et al., 2009; Specht et al., 2014). Optimism is associated with higher self-rated health (Steptoe et al., 2006), lower risk of mortality (Giltay et al., 2004), better physical functioning (Kim et al., 2014), and quicker recovery following adverse health events (Forgeard & Seligman, 2012) because it helps with more effective coping (Gallagher et al., 2013; Nes & Segerstrom, 2006) and flexible adjustment of goal pursuit (Hanssen et al., 2015; Ramírez-Maestre et al., 2019). In other words, optimism motivates action—because optimists view stressful situations positively, they are more likely to directly address the issue or adapt when things are uncontrollable.

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In the context of risk, we expected optimistic people to engage in behaviors that minimize risk. During the early stages of the pandemic, public health recommendations aimed at reducing the risk of infection through preventative behaviors (e.g., wearing a mask, staying at home) and avoiding risky behaviors (e.g., traveling). Optimism during the pandemic was associated with engaging in healthy behaviors (Guèvremont et al., 2022) and following government prevention guidelines (Lahav et al., 2021). As optimists generally engage in health-promoting behaviors and try to address the problem, we expected them to engage in more preventive behaviors and less risky behaviors to manage COVID-19 risk.

We also expected optimistic people to modify existing behaviors to adapt to constraints. The pandemic constrained behaviors typically encouraged for physical and emotional health (e.g., going to the gym, socializing). These are behaviors optimists typically engage in (Boehm et al., 2018; Steptoe et al., 2006) but because of their flexible and problem-focused approach to challenges, optimists might have adapted their behaviors in response to the pandemic. For example, optimists might have exercised at home or met with friends virtually, finding ways to allocate time and energy while minimizing in-person contact. Because optimism is theorized to motivate adaptive and flexible coping behaviors, we hypothesized that optimism would be associated with adaptive risk-reducing behaviors during the pandemic—increased engagement in activities at home and in preventative behaviors, as well as avoidance of risky behaviors.

2. How might optimism be associated with psychological well-being during the pandemic?

In general, optimism is associated with better mental health and quality of life, as well as fewer depressive and anxiety symptoms (Achat et al., 2000; Colby & Shifren, 2013; Giltay et al., 2006; Zenger et al., 2010). During the pandemic, optimism was linked with lower anxiety among healthcare workers (Prazeres et al., 2021; Schug et al., 2021). It was also associated with lower levels of distress in adverse situations both before and during the pandemic (Carver et al., 2010; Chasson et al., 2021; Vos et al., 2021). Further, optimists generally report feeling less lonely (Bu et al., 2020; Rius-Ottenheim et al., 2012), it was important to test whether optimism was a protective factor against loneliness. In addition, optimism is related to resilience (e.g., Jayawickreme et al., 2021; Killgore et al., 2020), the ability to maintain mental health despite adversity (Herrman et al., 2011). Thus, we expected optimism before the pandemic to be associated with better psychological well-being defined in the study as less worry, stress, and loneliness and greater resilience during the pandemic.

But why would optimism be tied to how people respond to psychologically stressful circumstances, like the pandemic? As previously discussed, this is potentially because optimists tend to use more effective coping strategies (Gallagher et al., 2013), directly addressing stressors rather than avoiding them (Nes & Segerstrom, 2006). We focused on three candidate mechanisms—physical activity, perceived social support, and perceived social strain.

Physical activity promotes physical and psychological well-being, including lower stress and loneliness (Aoyagi et al., 2010; Pate et al., 1995; Pels & Kleinert, 2016). Optimists tend to engage in more physical activity (Boehm et al., 2018; Lipowski, 2012; Steptoe et al., 2006). Therefore, we expected that optimism would be associated with more physical activity during COVID-19, which in turn is associated with better well-being.

In addition, optimists tend to have positive, high-quality relationships, reporting higher social support which are linked with better well-being (Assad et al., 2007; Chen & Feeley, 2014; Hodges & Winstanley, 2012; Janowski et al., 2012; Krohne & Slangen, 2005; Smith et al., 2013). Optimists tend to *perceive* and seek more support (Assad et al., 2007; Leahy et al., 2022; Nes & Segerstrom, 2006; Smith et al., 2013; Vollmann et al., 2011) and may feel less lonely due to this positive

perception of and availability of close relationships (Srivastava et al., 2006). This tendency may buffer loneliness by promoting a larger and more diverse social network (Andersson, 2012). Therefore, we expected that optimism would be linked with more perceived support and less strain during the pandemic, which in turn is associated with better psychological outcomes. In sum, we expected that optimism before the pandemic would be related to better psychological well-being during the pandemic through increases in physical activity and perceived improvements in relationships.

3. The Current study

We examined associations between optimism and COVID-19-related adaptation—behaviors and psychological well-being in a sample of middle-aged and older adults followed over four years. We hypothesized that higher optimism before the pandemic would be associated with adaptive behaviors during the pandemic (i.e., increased preventive behaviors, decreased risky behaviors, and enhanced engagement in home-based activities). We also hypothesized that optimism would be associated with better well-being (i.e., less worry, stress, and loneliness, as well as greater resilience). We examined increased physical activity and improved relationships as possible mechanisms for the link between optimism and well-being.

There has been a longstanding debate about whether optimism is a unidimensional construct (i.e., optimism–pessimism should be considered on a continuum) or whether optimism and pessimism represent related but independent constructs. A *meta*-analysis by Scheier et al. (2021) reported that the absence of pessimism appears to be more strongly associated with physical health outcomes than the presence of optimism. Some studies provide similar conclusions with psychological outcomes (e.g., Chang et al., 1997). In the present context of health-relevant behaviors and psychological well-being during the pandemic, we followed the approach taken by Scheier and colleagues (2021) to provide a more comprehensive study of optimism. Specifically, we analyzed overall/combined optimism as well as the optimism and pessimism subscales. The analysis code can be found at https://osf.io/kvpzm/?view_only = 2a78911e0d5245e4b18b3229d5c59591.

4. Method

4.1. Participants

Participants were 3,620 middle-aged and older adults (M_{age} = 65.88, SD = 10.17; 61.1 % were women) from the Health and Retirement Study (HRS). The HRS is a prospective panel study that collects a nationally representative sample of Americans aged 50+ (Sonnega et al., 2014). Data have been collected every two years since 1992. The University of Michigan's Institute for Social Research is responsible for the study and provides documentation about the protocol, instrumentation, sampling strategy etc. Information about data access is at https://hrsdata.isr.umich.edu/data-products/. Regarding race/ethnicity, 65.4 % identified as White, 17.9 % as black, 12.7 % as Hispanic/Latino, and 4.0 % as mixed race/other. Participants averaged 13.35 (SD = 2.90) years of education.

Data come from the 2016 and 2020 waves of data collection as a random 50 % of respondents were selected for an enhanced face-to-face interview in 2016 and then followed up in 2020 via mail for an

expanded COVID-19-related survey. The 2020 wave of data collection occurred between March 2020 and May 2021; 50 % of the sample participated by August and most (95.58 %) had participated by December 2020.[1] Compared to everyone who did not have data at both waves, participants in this study were more optimistic ($d = 0.16$), exercised more ($d = 0.17$), reported more support ($d = 0.07$), and less strain ($d = 0.10$) at baseline, but were otherwise comparable. Since range restriction attenuates associations, the true association between optimism/pessimism and mediators (physical activity, social support, and strain) may be larger than those reported in this study. A sensitivity analysis using G*Power suggested that at $\alpha = 0.05$, we had 99 % power to detect effects larger than $f^2 = 0.007$ and 80 % power to detect effects larger than $f^2 = 0.003$ in a linear multiple regression model with 5 variables (Faul et al., 2007). There was some ambiguity about the magnitude of the estimated indirect effects (and thus prevents us from conducting an informed power analysis, especially after the fact), so we treated these tests as exploratory given that our large sample could likely detect a relatively small indirect effect.

Because we analyzed an existing data source, the [BLINDED] Institutional Review Board considered this research exempt from ethical oversight as it did not constitute human subjects research. The study was not pre-registered.

4.2. Measures

4.2.1. Optimism and pessimism

In 2016, optimism and pessimism were measured using the Life Orientation Test-Revised (LOT-R (Scheier et al., 1994; Tindle et al., 2009). Participants rated their agreement on a scale ranging from 1 (*strongly disagree*) to 6(*strongly agree*). We calculated the overall/combined measure of optimism with all six items ($\alpha = 0.77$). Negatively worded items were reverse scored before creating an average. We also separately calculated subscales of optimism ($\alpha = 0.82$; e.g., "In uncertain times, I usually expect the best.") and pessimism ($\alpha = 0.75$; e.g., "I hardly ever expect things to go my way."); each subscale consisted of three items each.

4.2.2. Outcomes

In 2020, several COVID-19-related behaviors and psychological well-being factors were measured to assess adaptation to COVID-19.

4.2.2.1. COVID-19-related behaviors. **Preventative behavior.** Preventative health behavior was assessed with a 4-item measure: "Since the coronavirus pandemic, have you…" to which participants responded on a 3-point scale ranging from 1(*never*), 2(*sometimes*), to 3(*always*). The behaviors included: wearing a mask in public, washing hands more frequently, social distancing in public, and using special hand sanitizers or disinfectants. We computed an average ($\alpha = 0.76$).

Risky Behavior. Risky behavior was operationalized as an average ($\alpha = 0.82$) of five activities participants could engage in public that, at the time of the survey, were deemed risky. The question asked, "Since the coronavirus pandemic, have you changed how often you…" and participants responded on a 3-point scale ranging from 1(*do less often*), 2 (*about the same*), to 3(*do more often*). The behaviors included: leave your home, go shopping, travel to visit family members, travel to visit friends, and attend religious services outside your home.

Staying at Home. We assessed activities people did from home or

safely around their home. The question asked, "Since the coronavirus pandemic, have you changed how often you…" and participants responded on a 3-point scale ranging from 1(*do less often*), 2(*about the same*), to 3(*do more often*). The behaviors included: (1) pray or do other spiritual activities at home, (2) exercise at home, (3) walk outside your home for more than 20 min, (4) do hobbies, crafts, or puzzles, (5) watch TV, Netflix, stream movies, or shows, (6) listen to music, (7) do garden work or home repairs, (8) read books, magazines, or newspapers (in print or digitally), (9) meditate, and (10) meet with social groups on Zoom or other online video conference sites. We computed an average across the ten stay-at-home-type behaviors ($\alpha = 0.76$).

4.4.2.2. COVID-19-related psychological well-being. **Worry.** Worry was assessed with five items that started with: "Because of the coronavirus pandemic how worried are you about…" on a scale ranging from 0(*not at all worried*) to 10(*very worried*). The worries included (1) your own health, (2) the health of others in your family, (3) your financial situation, (4) being able to get help if you needed it from family, friends, or others, and (5) what will happen in the future. We computed an average ($\alpha = 0.87$).

Stress. Stress was measured with two items: "Since the coronavirus pandemic, how often did you feel emotionally overwhelmed?" and "Since the coronavirus pandemic, how often did you feel stressed?" on a scale ranging from 1(*hardly ever or never*), 2(*sometimes*), to 3(*often*). We computed an average ($\alpha = 0.85$).

Loneliness. Loneliness was assessed with a single item, "Since the coronavirus pandemic, how often have you felt lonely?" on a response scale with options 1(*hardly ever or never*), 2(*sometimes*), and 3(*often*).

Resilience. Resilience was measured with five items tapping into positive thinking and benefit-finding. Participants responded to the prompt, "How much do the following statements describe your experiences since the coronavirus pandemic?" on a scale ranging from 1 (strongly disagree) to 6(strongly agree). The items included: (1) "I tend to recover quickly after difficult times like this one," (2) "I have learned some positive things from this situation about myself," (3) "I found greater meaning in work or my other activities and hobbies," (4) "I now feel more in touch with people in my local community," (5) "I found new ways to connect socially with other people," and (6) "I am now more appreciative of things that I had taken for granted before." We computed an average ($\alpha = 0.80$).

4.2.3. Mediators

We hypothesized that physical activity and perceived relationship quality would mediate associations between optimism (in 2016) and COVID-19-related psychological well-being (in 2020). Mediators were measured in 2016 and 2020.

4.2.3.1. Physical Activity. We assessed physical activity with three questions. Participants answered how often they engaged in forms of light (e.g., vacuuming, laundry), moderate (e.g., gardening, walking at a moderate pace), and vigorous (e.g., running/jogging, working out at the gym) forms of physical activity on a scale from 1(*hardly ever or never*) to 5(*every day*). To reduce the number of mediators (and by extension, statistical tests) and because the various forms of physical activity were moderately correlated (often up to $r = 0.43$), we averaged the three items ($\alpha_{2016} = 0.65$; $\alpha_{2020} = 0.66$). Nevertheless, examining them as separate mediators in a follow-up analysis revealed comparable results in terms of magnitude and direction to what is reported below.

4.2.3.2. Social Support and Strain from Relationships. We assessed support and strain from spouses, children, (immediate) family members, and friends. Three questions were about support (e.g., "How much do they really understand the way you feel about things?") and four questions were about strain (e.g., "How much do they let you down when you are counting on them?") from each relationship. Participants

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responded to each question on a scale ranging from 1(*a lot*) to 4(*not at all*). Participants were directed to think of "any other immediate family, for example, any brothers or sisters, parents, cousins or grandchildren" to distinguish these relationships from relationships with spouses and children. We averaged these items across relationships to include participants missing data on any relationship (e.g., did not have children). Support ($\alpha_{2016} = 0.81$; $\alpha_{2020} = 0.81$) and strain ($\alpha_{2016} = 0.86$; $\alpha_{2020} = 0.84$) were intercorrelated ($-.50 < rs < -0.08$), but we created separate support and strain factors based on previous work (Chopik, 2017).

4.3. Analytic strategy

We first examined bivariate correlations and descriptive statistics for study variables. Due to observed socio-demographic differences and disparities, we controlled for age, gender ($-1 =$ men, $1 =$ women), race/ethnicity ($-1 =$ White, $1 =$ person of color), and education in all subsequent analyses.

We then formally examined optimism and pessimism as independent variables relating to COVID-19-related adaptation outcomes. We ran separate multiple regressions predicting preventative behavior, risky behavior, staying at home, worry, stress, loneliness, and resilience in 2020 from overall optimism (seven models), and two subscales of optimism and pessimism (seven models) in 2016.

Last, we tested whether physical activity and support/strain mediated the associations between optimism/pessimism and well-being. We used Mplus 8.1 (Muthén & Muthén, 2017) to test three mediators and four psychological outcomes (worry, stress, loneliness, resilience) simultaneously. Mediators measured in 2016 were included to estimate residualized change in each mediator (e.g., resilience is a function of optimism through support in 2020, and support in 2020 is a function of support in 2016). We estimated 5,000 bootstrapped samples while controlling for covariates. Models included covariances among the

outcomes and covariances between support and strain at each wave. The first model used the overall optimism scale. The second model used both optimism and pessimism subscales as independent variables while allowing their covariance.

5. Results

Table 1 provides correlations and descriptive statistics. Higher optimism (overall and subscale) and lower pessimism were associated with more exercise and perceiving more support and less strain from close relationships both cross-sectionally and prospectively. Higher optimism and lower pessimism were also prospectively associated with less risky behavior and a higher likelihood of staying home but was unassociated with preventative behavior. Higher optimism and lower pessimism were prospectively associated with less worry, less stress, less loneliness, and greater resilience.

Worry, stress, and loneliness were intercorrelated ($rs > 0.34$) and correlated weakly with resilience. Cross-sectionally and prospectively, physical activity was correlated with more stay-at-home-type behavior and resilience; with less risky behavior, worry, stress, and loneliness. Perceiving more support was correlated with more preventative behavior, stay-at-home-type behavior and resilience; with less risky behavior, worry, stress, and loneliness. Perceiving more strain was correlated with more worry, stress, and loneliness; with less risky behavior (although this association was small).

Compared to men, women were less likely to exercise, perceived more social support, engaged in more preventative behavior, less risky behavior, and were more likely to stay at home. Women were more worried, stressed, and lonely but also more resilient. People of color (vs. White) were less optimistic, more pessimistic exercised less, and perceived more strain. They also engaged in more preventative behavior and were more worried, stressed, and resilient. Older adults were more

Table 1
Descriptive statistics for study variables.

	M/%	SD	1	2	3	4	5	6	7
1. Gender	61.1 % female								
2. Race	34.6 % people of color		0.04**						
3. Age	65.88	10.17	−0.02	−0.21***					
4. Education	13.35	2.90	−0.03	−0.24***	−0.06***				
5. Optimism (6-items)	4.55	0.97	0.03	−0.05**	0.07***	0.23***			
6. Optimism (3-items)	4.61	1.13	0.03	0.09***	0.04*	0.05**	0.79***		
7. Pessimism (3-items)	2.50	1.25	−0.02	0.16***	−0.07***	−0.30***	−0.83***	−0.32***	
8. Exercise 2016	2.54	0.70	−0.07***	−0.06***	−0.09***	0.13***	0.19***	0.14***	−0.18***
9. Social Support 2016	3.15	0.53	0.10***	0.01	0.03	0.004	0.29***	0.24***	−0.23***
10. Social Strain 2016	1.66	0.47	0.03	0.15***	−0.24***	−0.05**	−0.28***	−0.19***	0.26***
11. Exercise 2020	2.91	0.96	−0.07***	−0.06***	−0.22***	0.18***	0.20***	0.13***	−0.19***
12. Social Support 2020	3.18	0.54	0.11***	0.003	0.05**	0.01	0.27***	0.24***	−0.20***
13. Social Strain 2020	1.59	0.46	0.03	0.14***	−0.24***	−0.05**	−0.25***	−0.18***	0.23***
14. Preventative Behavior 2020	2.82	0.32	0.15***	0.19***	0.01	−0.06***	0.02	0.05**	0.01
15. Risky Behavior 2020	1.28	0.39	−0.09***	0.02	−0.01	−0.12***	−0.10***	−0.06***	0.10***
16. Staying at Home 2020	2.25	0.34	0.12***	−0.03	−0.05**	0.23***	0.11***	0.06***	−0.12***
17. COVID-19 Worry	4.85	2.58	0.08***	0.22***	−0.12***	−0.17***	−0.26***	−0.15***	0.27***
18. COVID-19 Stress	1.63	0.60	0.23***	0.08***	−0.15***	−0.06**	−0.19***	−0.14***	0.17***
19. COVID-19 Loneliness	1.55	0.65	0.15***	−0.02	0.01	−0.02	−0.20***	−0.17***	0.15***
20. COVID-19 Resilience	4.19	0.97	0.09***	0.15***	−0.06***	0.02	0.20***	0.23***	−0.10***

8	9	10	11	12	13	14	15	16	17	18	19
0.08***											
−0.04*	−0.32***										
0.56***	0.09***	−0.02									
0.06***	0.62***	−0.27***	0.09***								
−0.03	−0.24***	0.63***	−0.01	−0.33***							
−0.03*	0.08***	0.01	0.04*	0.06**	0.01						
−0.07***	−0.08***	−0.04*	−0.07***	−0.05**	0.01	−0.23***					
0.14***	0.07***	−0.02	0.16***	0.10***	−0.04*	0.12***	−0.16***				
−0.10***	−0.10***	0.20***	−0.13***	−0.13***	0.22***	0.25***	−0.20***	0.02			
−0.04*	−0.07***	0.21***	−0.04*	−0.07***	0.25***	0.15***	−0.18***	0.11***	0.45***		
−0.05**	−0.11***	0.17***	−0.09***	−0.15***	0.20***	0.06**	−0.17***	0.06***	0.34***	0.51***	
0.13***	0.16***	0.01	0.15***	0.21***	−0.05**	0.18***	−0.04*	0.19***	−0.05**	−0.06**	−0.12***

Note. Gender: −1: men, 1: women. Race: −1: white, 1: person of color. *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.

optimistic, less pessimistic exercised less, and reported more social strain. They were also less likely to stay home and were less worried, stressed, and resilient.

Those with higher levels of education were more optimistic, less pessimistic, exercised more, and reported less social strain. They were also more likely to stay home but less likely to engage in preventative and risky behavior, and reported less worry, stress, and resilience. Given these socio-demographic differences and disparities, age, gender, race/ethnicity, and education were controlled for in subsequent analyses.

5.1. Are optimism and pessimism associated with COVID-19 Adaptation?

We next examined associations between optimism and COVID-19-related outcomes, controlling for covariates. Consistent with bivariate correlations, overall optimism (Table 2) was associated with less risky behavior and more stay-at-home type behavior, but not with preventative behavior. Optimism was also associated with less worry, stress, and loneliness, and more resilience.

In the subscale analysis, subscales of optimism and pessimism were entered into the same model (Table 3). Controlling for each other, optimism and pessimism were independently associated with psychological well-being consistent with bivariate correlations, and the effect size of pessimism was not always greater than the effect size of optimism. However, only pessimism, and not optimism, was associated with greater risky behaviors and doing fewer activities at home.

5.2. Do physical activity and perceived social Support/Strain mediate associations between Optimism/Pessimism and psychological well-being during COVID-19?

We tested whether physical activity and support/strain mediated the associations between optimism/pessimism and well-being during the pandemic. Figs. 1 and 2 illustrate the mediations and presents standardized coefficients. Table 4 presents results for overall optimism. Table 5 presents results for the optimism and pessimism subscales. For optimism, results did not differ whether it was measured as an overall score or a subscale, controlling for pessimism. There were some differences with pessimism. We discuss the results for each outcome.

Physical activity, support and strain all mediated the association between (overall and subscale) optimism and worry. Higher optimism was associated with increases in physical activity and support, and reductions in strain, which in turn, were associated with feeling less worried during the pandemic. Physical activity and strain, but not support, mediated the association between pessimism and worry. Higher pessimism was associated with decreases in physical activity and greater strain, which in turn were associated with feeling more worried.

Perceived strain mediated the association between optimism/pessimism and stress. Higher optimism/lower pessimism was associated with decreases in strain, which in turn was associated with less stress. The associations between physical activity/support and stress were small and overall indirect effects were not significant.

Perceived support and strain mediated the association between optimism/pessimism and loneliness. Higher optimism and lower pessimism were associated with increases in support and decreases in strain, which in turn, were associated with less loneliness. The association between physical activity and loneliness was small and the overall indirect effect was not significant.

Physical activity and support mediated the link between optimism/pessimism and resilience. Higher optimism and lower pessimism were associated with increases in physical activity and support, which were in turn associated with more resilience. The association between strain and resilience was small and the overall indirect effect was not significant.

Altogether, increases in physical activity and perceived support, and decreases in strain partially explained the link between optimism/pessimism and COVID-19-related psychological well-being. Nevertheless, indirect effects were small and pairwise contrasts between the

indirect effects revealed that some indirect effects were not always significantly different from each other. For example, the smallest significant indirect effect ($\beta = -0.004$) was not significantly different from the largest non-significant indirect effect ($\beta = -0.003$) for overall optimism.

6. Discussion

We examined optimism as a potential protective factor during the pandemic. We also evaluated the evidence for whether optimism and pessimism are two independent constructs in this new context (i.e., is the presence of optimism or absence of pessimism associated with pandemic outcomes?). This was a critical test of whether optimism/pessimism *before* a new adverse event was associated with adaptation during the event. Using a representative sample of middle-aged and older adults, we found that people who were more optimistic in 2016 better adapted psychologically and behaviorally to COVID-19 in 2020. Specifically, overall optimism was associated with engaging in fewer risky behaviors and spending more time at home, suggesting optimists behaved in ways that minimized risk. However, when separating optimism from pessimism, we found that the associations with health-relevant behaviors were driven by pessimism. Both optimism and pessimism had independent associations with psychological well-being—higher optimism and lower pessimism were associated with less worry, stress, and loneliness, but more resilience. Physical activity, social support and strain were significant mediators for most of the psychological well-being outcomes. Increases in physical activity explained less worry and more resilience; increases in support explained less worry and loneliness and more resilience; decreases in strain explained less worry, stress, and loneliness.

6.1. Were optimism and pessimism associated with engaging in behaviors that minimize the risk of COVID-19?

COVID-19 disrupted normal life particularly in 2020 with strict and novel lockdowns and regulations. As optimism is associated with engaging in healthier behaviors (Boehm et al., 2018; Guèvremont et al., 2022) and more effective coping strategies (Nes & Segerstrom, 2006), we expected that optimism would be prospectively linked with adaptive behaviors during the pandemic in the U.S. as it did cross-sectionally in China (Lahav et al., 2021). Overall optimism was associated with fewer risky behaviors and more activity at home but not with preventative behaviors. In other words, people who were more optimistic generally adapted new behaviors or modified their existing behaviors that could minimize risk and promote well-being.

Optimism was not significantly associated with preventative behavior—possibly due to a ceiling effect for preventative behaviors ($M=2.82$, $SD=.32$, max = 3.00). Our results could mean that, regardless of differences in optimism, most people followed basic health guidelines and frequently engaged in basic preventative behaviors, such as washing hands, distancing in public, and masking (older adults also tended to engage in more preventative behaviors than younger adults; Korn et al., 2022). However, this result could be an artifact of how variables were measured; preventative behaviors were measured on a different and shorter scale (never-always) than risky behaviors and staying at home (less frequently-more frequently). There may be more variability in preventative behaviors than what could be captured with three response options and those particular response anchors. Nevertheless, our findings strengthen the existing body of evidence around optimism being a resource during difficult times by motivating action—optimistic people before the pandemic generally behaved in ways that minimized risk.

Interestingly, using the subscale optimism and pessimism, we found that pessimism drove the associations between overall optimism and health behaviors. This is consistent with recent *meta*-analytic findings that, when it comes to physical health outcomes, the absence of pessimism appears to be more strongly associated with them than the

Table 2

Regressions predicting COVID-19-related behaviors and psychological well-being from overall optimism.

Preventative Behavior	b	SE	β	t	p	95 % Confidence Interval	
						LB	UB
Intercept	2.72	0.05		56.66	< 0.001	2.63	2.82
Optimism	0.01	0.01	0.02	1.32	0.187	−0.004	0.02
Age	0.001	0.001	0.05	2.73	0.006	0.000	0.002
Gender	0.05	0.01	0.15	8.89	< 0.001	0.04	0.06
Race	0.06	0.01	0.19	10.65	< 0.001	0.05	0.07
Education	−0.002	0.002	−0.02	−0.83	0.404	−0.01	0.002

Note. $F_{(5, 3507)} = 43.08$, $p < .001$, $R^2 = .06$. Gender: -1=men, 1=women. Race: -1=white, 1=person of color. LB: lower bound; UB: Upper bound

Risky Behavior	b	SE	β	t	p	LB	UB
Intercept	1.65	0.06		27.77	< 0.001	1.54	1.77
Optimism	**−0.03**	**0.01**	**−0.07**	**−4.15**	**< 0.001**	**−0.04**	**−0.02**
Age	−0.001	0.001	−0.02	−1.03	0.303	−0.002	0.001
Gender	−0.04	0.01	−0.09	−5.29	< 0.001	−0.05	−0.02
Race	−0.01	0.01	−0.01	−0.68	0.499	−0.02	0.01
Education	−0.01	0.002	−0.11	−6.05	< 0.001	−0.02	−0.01

Note. $F_{(5, 3468)} = 19.66$, $p < 0.001$, $R^2 = 0.03$.

Staying at Home	b	SE	β	t	p	LB	UB
Intercept	2.06	0.05		39.26	< 0.001	1.95	2.16
Optimism	**0.03**	**0.01**	**0.08**	**4.94**	**< 0.001**	**0.02**	**0.04**
Age	−0.002	0.001	−0.06	−3.31	0.001	−0.003	−0.001
Gender	0.04	0.01	0.12	7.46	< 0.001	0.03	0.06
Race	−0.01	0.01	−0.02	−1.10	0.272	−0.02	0.01
Education	0.01	0.002	0.11	5.97	< 0.001	0.01	0.02

Note. $F_{(5, 3492)} = 30.43$, $p < 0.001$, $R^2 = 0.04$.

Worry	b	SE	β	t	p	LB	UB
Intercept	9.85	0.37		26.35	< 0.001	9.12	10.59
Optimism	**−0.62**	**0.04**	**−0.23**	**−14.36**	**< 0.001**	**−0.70**	**−0.54**
Age	−0.02	0.004	−0.07	−3.97	< 0.001	−0.03	−0.01
Gender	0.20	0.04	0.08	4.84	< 0.001	0.12	0.28
Race	0.47	0.05	0.18	10.46	< 0.001	0.39	0.56
Education	−0.07	0.02	−0.08	−4.90	< 0.001	−0.10	−0.04

Note. $F_{(5, 3507)} = 102.20$, $p < 0.001$, $R^2 = 0.13$.

Stress	b	SE	β	t	p	LB	UB
Intercept	2.64	0.09		29.70	< 0.001	2.47	2.82
Optimism	**−0.12**	**0.01**	**−0.19**	**−11.29**	**< 0.001**	**−0.14**	**−0.10**
Age	−0.01	0.001	−0.12	−7.46	< 0.001	−0.01	−0.01
Gender	0.15	0.01	0.23	14.63	< 0.001	0.13	0.17
Race	0.02	0.01	0.03	1.77	0.076	−0.002	0.04
Education	−0.002	0.004	−0.01	−0.63	0.530	−0.01	0.01

Note. $F_{(5, 3476)} = 86.99$, $p < 0.001$, $R^2 = 0.11$.

Loneliness	b	SE	β	t	p	LB	UB
Intercept	1.96	0.10		20.20	< 0.001	1.77	2.15
Optimism	**−0.14**	**0.01**	**−0.21**	**−12.67**	**< 0.001**	**−0.16**	**−0.12**
Age	0.002	0.001	0.03	1.91	0.056	0.000	0.004
Gender	0.10	0.01	0.16	9.54	< 0.001	0.08	0.13
Race	−0.01	0.01	−0.02	−1.20	0.230	−0.04	0.01
Education	0.01	0.004	0.02	1.33	0.183	−0.002	0.01

Note. $F_{(5, 3514)} = 49.55$, $p < 0.001$, $R^2 = 0.07$.

Resilience	b	SE	β	t	p	LB	UB
Intercept	3.54	0.15		24.10	< 0.001	3.25	3.83
Optimism	**0.20**	**0.02**	**0.20**	**11.84**	**< 0.001**	**0.17**	**0.23**
Age	−0.004	0.002	−0.05	−2.62	0.009	−0.01	−0.001
Gender	0.07	0.02	0.07	4.39	< 0.001	0.04	0.10
Race	0.15	0.02	0.15	8.47	< 0.001	0.12	0.19
Education	0.004	0.01	0.01	0.68	0.494	−0.01	0.02

Note. $F_{(5, 3452)} = 52.06$, $p < 0.001$, $R^2 = 0.07$.

Table 3

Regressions predicting COVID-19-related behaviors and psychological well-being from optimism and pessimism subscales.

Preventative Behavior	b	SE	β	t	p	95 % Confidence Interval	
						LB	UB
Intercept	2.71	0.06		48.488	0<.001	2.601	2.821
Optimism	0.01	0.01	0.025	1.412	0.158	−0.003	0.017
Pessimism	0.000	0.01	−0.001	−0.063	0.950	−0.009	0.009
Age	0.002	0.001	0.050	2.932	0.003	0.001	0.003
Gender	0.05	0.01	0.148	9.007	0<.001	0.038	0.059
Race	0.06	0.01	0.182	10.356	0<.001	0.049	0.073
Education	−0.001	0.002	−0.011	−0.646	0.518	−0.005	0.003

Note. $F_{(6, 3500)} = 36.29$, $p < 0.001$, $R^2 = 0.06$. Gender: −1: men, 1: women. Race: −1: white, 1: person of color. LB: lower bound; UB: Upper bound.

Risky Behavior	b	SE	β	t	p	LB	UB
Intercept	1.51	0.070		21.751	0<.001	1.377	1.650
Optimism	−0.01	0.006	−0.028	−1.577	0.115	−0.022	0.002
Pessimism	**0.019**	**0.006**	**0.060**	**3.200**	**0.001**	**0.007**	**0.030**
Age	−0.001	0.001	−0.018	−1.026	0.305	−0.002	0.001
Gender	−0.035	0.007	−0.089	−5.275	0<.001	−0.048	−0.022
Race	−0.006	0.007	−0.015	−0.829	0.407	−0.020	0.008
Education	−0.014	0.002	−0.105	−5.802	0<.001	−0.019	−0.009

Note. $F_{(6, 3468)} = 16.46$, $p < 0.001$, $R^2 = 0.03$.

Staying at Home	b	SE	β	t	p	LB	UB
Intercept	2.228	0.061		36.330	0<.001	2.108	2.348
Optimism	0.007	0.005	0.023	1.295	0.196	−0.004	0.018
Pessimism	**−0.023**	**0.005**	**−0.084**	**−4.515**	**0.000**	**−0.033**	**−0.013**
Age	−0.002	0.001	−0.056	−3.270	0.001	−0.003	−0.001
Gender	0.044	0.006	0.124	7.479	0<.001	0.032	0.055
Race	−0.005	0.006	−0.013	−0.707	0.479	−0.017	0.008
Education	0.012	0.002	0.099	5.544	0<.001	0.008	0.016

Note. $F_{(6, 3491)} = 26.10$, $p < 0.001$, $R^2 = 0.04$.

Worry	b	SE	β	t	p	LB	UB
Intercept	7.147	0.438		16.336	0<.001	6.289	8.005
Optimism	**−0.241**	**0.038**	**−0.106**	**−6.289**	**0<.001**	**−0.316**	**−0.166**
Pessimism	**0.371**	**0.037**	**0.179**	**10.135**	**0<.001**	**0.299**	**0.443**
Age	−0.017	0.004	−0.065	−3.994	0<.001	−0.025	−0.008
Gender	0.203	0.042	0.077	4.878	0<.001	0.122	0.285
Race	0.458	0.046	0.169	9.968	0<.001	0.368	0.548
Education	−0.069	0.015	−0.077	−4.493	0<.001	−0.099	−0.039

Note. $F_{(6, 3485)} = 26.10$, $p < 0.001$, $R^2 = 0.13$.

Stress	b	SE	β	t	p	LB	UB
Intercept	2.202	0.104		21.177	0<.001	1.998	2.406
Optimism	**−0.054**	**0.009**	**−0.101**	**−5.874**	**0<.001**	**−0.072**	**−0.036**
Pessimism	**0.062**	**0.009**	**0.128**	**7.138**	**0<.001**	**0.045**	**0.079**
Age	−0.007	0.001	−0.123	−7.427	0<.001	−0.009	−0.005
Gender	0.145	0.010	0.234	14.582	0<.001	0.126	0.165
Race	0.019	0.011	0.029	1.695	0.090	−0.003	0.040
Education	−0.002	0.004	−0.009	−0.542	0.588	−0.009	0.005

Note. $F_{(6, 3469)} = 73.30$, $p < 0.001$, $R^2 = 0.11$.

Loneliness	b	SE	β	t	p	LB	UB
Intercept	1.54	0.11		13.54	0<.001	1.318	1.764
Optimism	**−0.08**	**0.01**	**−0.14**	**−7.94**	**0<.001**	**−0.099**	**−0.060**
Pessimism	**0.06**	**0.01**	**0.12**	**6.65**	**0<.001**	**0.045**	**0.082**
Age	0.002	0.001	0.03	1.81	0.070	0.000	0.004
Gender	0.10	0.01	0.16	9.52	0<.001	0.082	0.125
Race	−0.01	0.01	−0.02	−1.06	0.291	−0.036	0.011
Education	0.004	0.004	0.02	1.09	0.274	−0.003	0.012

Note. $F_{(6, 3508)} = 41.21$, $p < 0.001$, $R^2 = 0.07$.

Resilience	b	SE	β	t	p	LB	UB
Intercept	3.63	0.17		21.23	0<.001	3.29	3.96
Optimism	**0.18**	**0.02**	**0.20**	**11.70**	**0<.001**	**0.15**	**0.21**

Table 3 (*continued*)

Resilience	b	SE	β	t	p	LB	UB
Pessimism	**−0.03**	**0.01**	**−0.04**	**−2.35**	**0.019**	**−0.06**	**−0.01**
Age	−0.004	0.002	−0.04	−2.51	0.012	−0.01	−0.001
Gender	0.07	0.02	0.07	4.52	0<.001	0.04	0.11
Race	0.13	0.02	0.13	7.49	0<.001	0.10	0.17
Education	0.01	0.01	0.03	1.71	0.088	−0.002	0.02

Note. $F_{(6, 3446)} = 50.32$, $p < 0.001$, $R^2 = 0.08$.
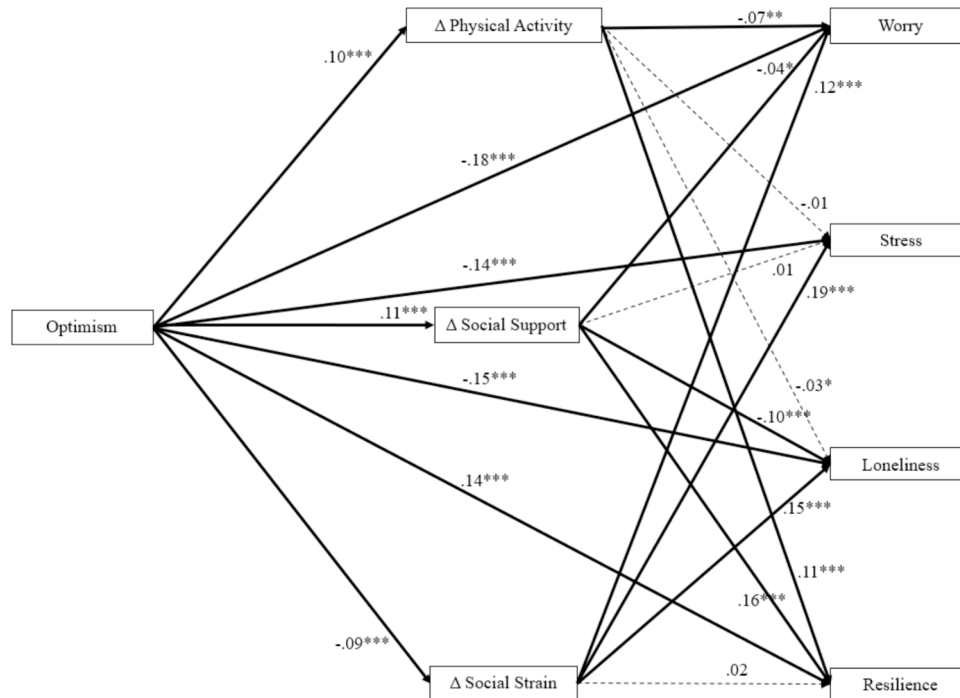
Fig. 1. Indirect Effects Linking Overall Optimism to Psychological Well-being *Note.* Bolded: significant indirect effects. Depicted estimates are standardized coefficients. Mediators measured in 2016 were included as predictors of mediators in 2020. Covariates: age, gender, race/ethnicity, education. *p < 0.05, **p < 0.01, ***p < 0.001.

presence of optimism (Scheier et al., 2021), and provides evidence for discriminant validity between optimism and pessimism.

6.2. Were optimism and pessimism associated with psychological well-being during COVID-19?

Because optimism is generally associated with psychological well-being (Achat et al., 2000; Colby & Shifren, 2013; He et al., 2013; Rius-Ottenheim et al., 2012; Segovia et al., 2012), we expected optimism to be associated with less worry, stress, and loneliness and greater resilience during the pandemic. First, our findings showed that people who were more optimistic in 2016 were indeed less worried, stressed, and lonely and more resilient in 2020, corroborating cross-sectional links between optimism and psychological well-being (Chasson et al., 2021; Prazeres et al., 2021; Schug et al., 2021; Vos et al., 2021).

Second, we expected these links to be explained by more frequent physical activity and better perceptions of their relationships. We generally found significant indirect effects across mediators (67 % significant tests), suggesting that optimism was associated with more physical activity and positive relationships, which in turn promote resilience. During the pandemic, people worried about their health, the availability of help from their social network, and the future more broadly. However, our findings suggest that optimistic people perceived more support and less strain from their relationships, and these perceptions likely signaled that they will receive help in the future that reduced these worries. Further, since physical activity is a concrete way

in which people can work toward improving their health, optimists may have alleviated their worries about health by engaging in health behaviors.

Nevertheless, physical activity and support/strain were not always significant mediators. Contrary to past research (e.g., Pels & Kleinert, 2016), physical activity did not mediate the association between optimism and loneliness even though optimism was associated with increases in physical activity during the pandemic. Perhaps physical activity before the pandemic included more social elements (e.g., playing sports with other people), but without the social element, increased solitary physical activity may not play as large a role in explaining how optimism is linked to lower loneliness. This raises the possibility that optimism buffers against loneliness specifically through social means or other means not considered here.

Although research links exercise and healthy support systems with lower stress (e.g., Schug et al., 2021), changes in physical activity or support did not explain the link between optimism and stress. Inconsistent mediations may suggest that optimism played a role in some outcomes through different pathways during the pandemic. However, across all indirect effects, the size of the significant indirect effects was small and close to zero ($\beta s \leq |.01|$), and not always statistically different from non-significant indirect effects, suggesting physical activity, support, and strain were relatively small contributors across all outcomes. While additional mechanisms for adaptation during the pandemic remain uncertain, optimism *before* the pandemic was associated with better psychological well-being, suggesting that optimism was a flexible
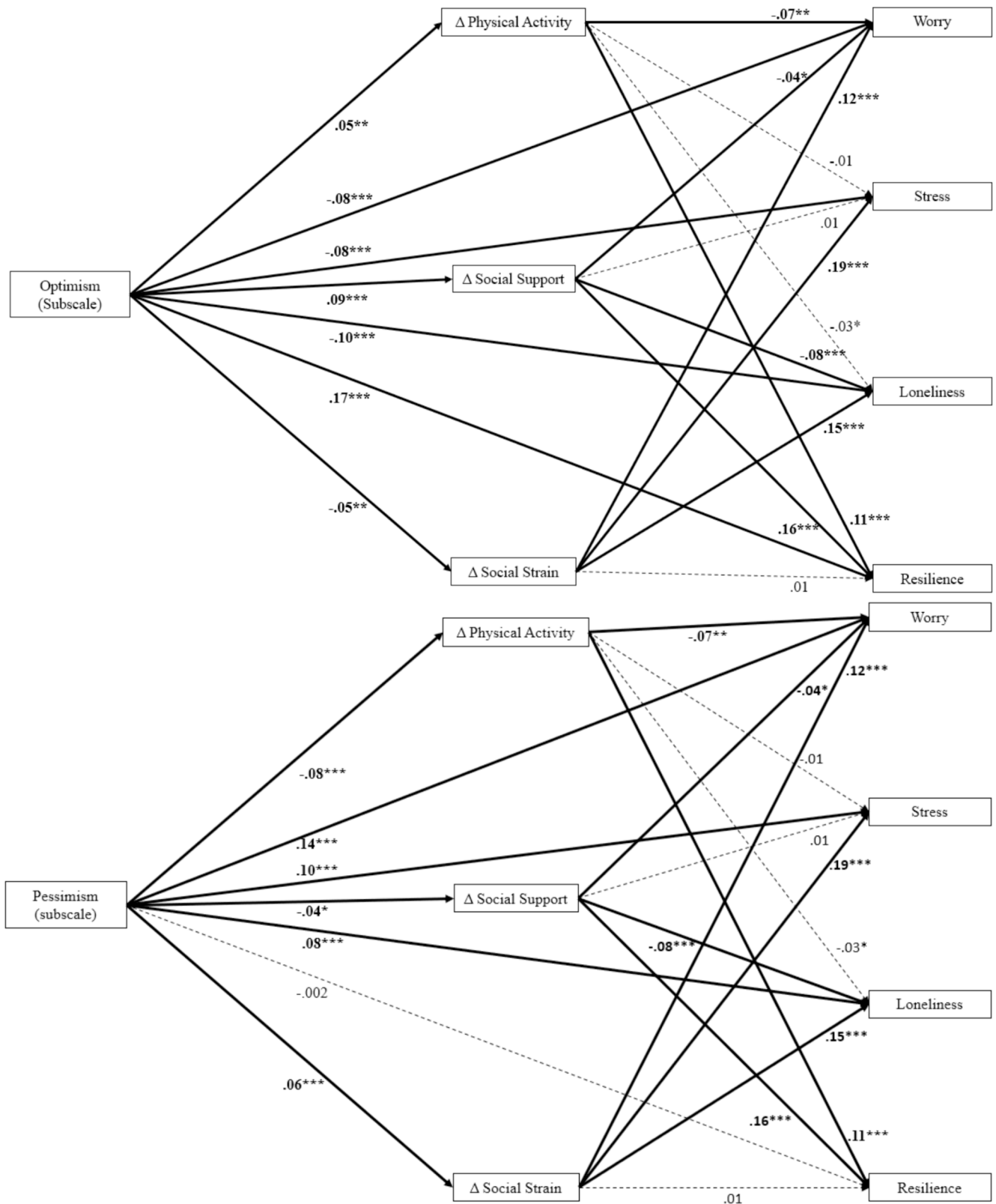
Fig. 2. Indirect Effects Linking Subscales of Optimism and Pessimism to Psychological Well-being *Note.* For easier visualization, optimism and pessimism are depicted separately although both were entered in the same model. Optimism and pessimism were correlated at $r = 0.32$. Bolded: significant indirect effects. Depicted estimates are standardized coefficients. Mediators measured in 2016 were included as predictors of mediators in 2020. Covariates: age, gender, race/ethnicity, education. *p < 0.05, **p < 0.01, ***p < 0.001.

Table 4
Indirect effects of associations between overall optimism and COVID-19-related psychological well-being.

	a path	b path	Indirect Effect	LB	UB	Standardized Indirect Effect	Prop Variance Explained
			COVID-19 Worry1				
Physical Activity	**0.10*** **	**−0.20*** **	**−0.02*** **	**−0.03**	**−0.01**	**−0.01*** **	**0.04**
Support	**0.06*** **	**−0.20***	**−0.01** **	**−0.02**	**−0.002**	**−0.004***	**0.02**
Strain	**−0.04*** **	**0.70*** **	**−0.03*** **	**−0.04**	**−0.02**	**−0.01*** **	**0.06**
			COVID-19 Stress2				
Physical Activity	0.10***	−0.01	−0.001	−0.003	0.001	−0.001	0.01
Support	0.06***	0.01	0.001	−0.002	0.003	0.001	0.01
Strain	**−0.04*** **	**0.25*** **	**−0.01*** **	**−0.014**	**−0.007**	**−0.02*** **	**0.10**
			COVID-19 Loneliness3				
Physical Activity	0.10***	−0.02*	−0.002	−0.01	0	−0.003	0.02
Support	**0.06*** **	**−0.10*** **	**−0.01*** **	**−0.01**	**−0.003**	**−0.01*** **	**0.09**
Strain	**−0.04*** **	**0.22*** **	**−0.01*** **	**−0.01**	**−0.006**	**−0.01*** **	**0.09**
			COVID-19 Resilience4				
Physical Activity	**0.10*** **	**0.12*** **	**0.01*** **	**0.007**	**0.016**	**0.01*** **	**0.06**
Support	**0.06*** **	**0.29*** **	**0.02*** **	**0.011**	**0.024**	**0.02*** **	**0.12**
Strain	−0.04***	0.03	−0.001	−0.005	0.002	−0.001	0.01

Note. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. Significant indirect effects are bolded. Prop Variance Explained = Variance explained by each indirect effect ÷ Total effect.
[1]Indirect effects don't differ from each other; c = -0.47***, c'=-0.06***.
[2]Indirect effect of strain is significantly greater in magnitude than the other two indirect effects; c = -0.09***, c'=-0.10***.
[3]Indirect effect of physical activity is significantly different from the indirect effect of strain c = 0.10***, c'=-0.02***.
[4]Indirect effects of physical activity and support are significantly larger than the indirect effect of strain; c = 0.14***, c'=.03***.

resource even in the face of new stressors.

When we examined optimism and pessimism separately, we found that results were largely similar across the subscales (and overall optimism) for psychological well-being. In other words, though the absence of pessimism may be more important for health-related behaviors, the presence of optimism and pessimism seem to be equally important for psychological well-being. Examining overall optimism may be more parsimonious approach for examining its influence on psychological well-being.

6.3. Limitations and future directions

Despite many strengths of the study including the prospective assessment of optimism and a variety of outcomes during the early stages of the pandemic, there are limitations worth noting and we suggest ways to address them.

First, although we observed several significant indirect effects, they were inconsistent and small. Mechanisms underlying the links between optimism and psychological outcomes may depend on the outcome (Kealy et al., 2022) and we may need to theorize on outcome-specific mechanisms. However, even significant mediators between optimism and COVID-19-related outcomes were small contributors. Therefore, an alternate future direction could be examining other explanatory variables not considered in this study. For instance, optimism was associated with higher well-being due to lower stress from work-family interference and fear of COVID-19 (Reizer et al., 2022). Perhaps there are COVID-specific mechanisms that more strongly link optimism and outcomes than the ones in this study. Even so, more important is that although we examined change in the mediators using mediators assessed in 2016, the mediators and outcomes were still measured at the same time. Cross-sectional and longitudinal data can yield different conclusions (O'Laughlin et al., 2018) and our findings need to be replicated using longitudinal data.

Second, we expected that optimism would be linked with more effective coping strategies but there may be demographic differences in coping. For example, White Americans and Korean Americans tend to use active coping strategies more than Black Americans (Lee & Mason, 2013). In dealing with adverse circumstances, Korean Americans assume more self-blame and Black Americans use more denial. Additionally, Asian Americans do not derive similar emotional and health benefits from optimism as White Americans do (Leong et al., 2022), while Black American derive similar health benefits from optimism that White Americans do (Hernandez et al., 2015; James et al., 2019; Tindle et al., 2009). We had a representative sample and controlled for race (White vs. person-of-color to ensure a large enough sample size for this group), but it is critical to examine whether results generalize across different racial/ethnic groups. Further, our sample consisted of mostly older adults, but proactive coping may be a stronger protective factor for COVID-19 stress for older adults than younger adults (Pearman et al., 2021). Because there are age differences in the types of COVID-related stressors people experience and concerns about COVID-19 (Klaiber et al., 2021), assessing the generalizability of the results in younger adults is also necessary.

Third, optimists tend to positively view close others and perceive greater support than what was provided (Srivastava et al., 2006; Vollmann et al., 2011). Thus, it is unclear whether the increase in support was from optimists receiving more or changing their perceptions in response to the pandemic. Either way, more optimistic people reported better psychological well-being during the pandemic. This result was mediated by perceptions of relationship quality but clarifying the exact mechanisms will better inform intervention efforts.

Fourth, we looked at early pandemic adaptation. However, COVID-19 continued and was a prolonged challenge for health-compromised individuals. Whether optimistic individuals continued to engage in adaptive behaviors and fared better throughout later stages of the pandemic through the same mechanisms is an open question. When stressors are too difficult and uncontrollable, continual efforts to tackle the problem head-on to overcome the problem can do more harm than good (Segerstrom, 2005). The pandemic could be categorized as an uncontrollable stressor that challenge such problem-focused coping. Nevertheless, coping is a dynamic process and optimism is associated with flexible coping (Nes & Segerstrom, 2006), so it is important to

Table 5

Indirect effects of associations between subscales of optimism and pessimism and COVID-19-related psychological well-being.

Optimism – Worry1							
	a path	b path	Indirect Effect	LB	UB	Standardized Indirect Effect	Prop Variance Explained
Physical Activity	**0.04****	**−0.20*****	**−0.01***	**−0.02**	**−0.003**	**−0.004***	**0.04**
Support	**0.04*****	**−0.21***	**−0.01***	**−0.02**	**−0.002**	**−0.004***	**0.04**
Strain	**−0.02****	**0.70*****	**−0.13****	**−0.02**	**−0.01**	**−0.01****	**0.06**
Pessimism – Worry2							
Physical Activity	**−0.06*****	**−0.20*****	**0.01****	**0.01**	**0.02**	**0.01****	**0.03**
Support	−0.02*	−0.21*	0.003	0.001	0.01	0.002	0.01
Strain	**0.02*****	**0.70*****	**0.02****	**0.01**	**0.03**	**0.01****	**0.05**
Optimism – Stress3							
Physical Activity	0.04**	−0.01	0<.001	−0.001	0.001	−0.001	0.00
Support	0.04***	0.01***	0<.001	−0.001	0.002	0.001	0.00
Strain	**−0.02****	**0.25*****	**−0.01****	**−0.01**	**−0.002**	**−0.01****	**0.11**
Pessimism – Stress4							
Physical Activity	−0.06***	−0.01	0<.001	−0.001	0.002	0.001	0.00
Support	−0.02*	0.01***	0<.001	−0.001	0<.001	0<.001	0.00
Strain	**0.02*****	**0.25*****	**0.01****	**0.003**	**0.009**	**0.01****	**0.12**
Optimism – Loneliness5							
Physical Activity	0.04**	−0.02*	−0.001	−0.002	0<.001	−0.002	0.01
Support	**0.04*****	**−0.10*****	**−0.004*****	**−0.01**	**−0.002**	**−0.01*****	**0.06**
Strain	**−0.02****	**0.22*****	**−0.004****	**−0.01**	**−0.001**	**−0.01****	**0.06**
Pessimism – Loneliness6							
Physical Activity	−0.06***	−0.02*	0.001	0<.001	0.003	0.003	0.02
Support	**−0.02***	**−0.10*****	**0.002***	**0<.001**	**0.003**	**0.003***	**0.04**
Strain	**0.02*****	**0.22*****	**0.01****	**0.002**	**0.01**	**0.01****	**0.10**
Optimism – Resilience7							
Physical Activity	**0.04****	**0.12*****	**0.01****	**0.002**	**0.01**	**0.01****	**0.03**
Support	**0.04*****	**0.28*****	**0.01*****	**0.01**	**0.02**	**0.01*****	**0.08**
Strain	−0.02**	0.03	0<.001	−0.003	0.001	−0.001	0.00
Pessimism – Resilience8							
Physical Activity	**−0.06*****	**0.12*****	**−0.01*****	**−0.01**	**−0.004**	**−0.01*****	**0.54**
Support	−0.02*	0.28***	−0.01*	−0.01	−0.001	−0.01*	0.38
Strain	0.02***	0.03	0.001	−0.001	0.003	0.001	0.08

Note. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Significant indirect effects are bolded. Significant indirect effects are bolded. Prop Variance Explained = Variance explained by each indirect effect ÷ Total effect.

[1]Indirect effects don't differ from each other; c = -0.20***, c'=.03***.

[2]Indirect effect of strain is significantly greater in magnitude than the indirect effect of support; c = 0.33***, c'=.03***.

[3]Indirect effects of physical activity and support were significantly different from the indirect effect of strain; c = -0.05***, c'=-0.01**.

[4]Indirect effects of physical activity and support were significantly different from the indirect effect of strain; c = 0.05***, c'=.01**.

[5]Indirect effect of physical activity was significantly different from the rest; c = -0.07***, c'=-0.01***.

[6]Indirect effect of strain was significantly different from the rest; c = 0.05***, c'=.01***.

[7]Indirect effects of physical activity and support are significantly larger than the indirect effect of strain; the indirect effect of support is significantly larger than the indirect effect of physical activity; c = 0.16***, c'=.02***.

[8]The total effect of pessimism to resilience was small and not significant ($b = -0.013$, $p = 0.430$). The total indirect effect of pessimism to resilience was significant ($b = -0.011$, $p < 0.001$). Indirect effects of physical activity and support were significantly different from the indirect effect of strain; c = -0.01, c'=-0.01***.

examine how people coped over an extended period. Related, another open question is about geographic differences—the impact of the pandemic likely varied by geographic characteristics, but unfortunately these characteristics were not captured in the present study.

In general, there may be limits to generalizability of the findings and their long-term implications given the points we outlined above as well as other characteristics in our sample (e.g., our sample is mostly older adults with high school education). Nevertheless, our results suggested that optimism *can* be associated with adjusting behaviors in response to a new situation such as the pandemic and provided evidence that optimism is a resource because it motivates flexible coping.

7. Conclusion

We tested whether optimism was a psychosocial resource for facing challenges by examining whether optimism before the pandemic was

associated with better adaptation during the pandemic. We found that higher optimism and lower pessimism were associated with better behavioral and psychological adaptation during the early stages of the pandemic in the U.S. Particularly, people who were low on *pessimism* were more likely to avoid risky behaviors and adjust how they spend their time amid new constraints. People who were high on optimism and/or low on pessimism were also more likely to maintain their psychological well-being; this was partially explained by their engaging in more physical activity and perceiving more support and less strain from their social circle. Although this study provided evidence that optimists fared better even during new difficulties by changing their behaviors, the exact mechanisms underlying the link with psychological well-being require more examination.

Author contributions

The first author was involved in conceptualizing the study, analyzing the data, writing and revising of the manuscript. The second author was also involved in writing the manuscript. The third and fourth authors were involved in reviewing the manuscript. The last author was involved in conceptualizing the study, analyzing preliminary data, and reviewing the manuscript.

CRediT authorship contribution statement

Jeewon Oh: Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Emily N. Tetreau:** Writing – review & editing, Writing – original draft. **Mariah F. Purol:** Writing – review & editing. **Eric S. Kim:** Writing – review & editing. **William J. Chopik:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

I have shared the link to access and get information about publicly available data that were used for this project.

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