

POSITIVE AND NEGATIVE AFFECTIVE PROCESSES ASSOCIATED WITH FIREARM ACQUISITION AND OWNERSHIP

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Introduction: To examine positive and negative affective processes associated with firearm acquisition and firearm ownership. **Methods:** An online cross-sectional survey assessing firearm ownership, reasons for firearm ownership, intentions to acquire a firearm in the next 12 months, and positive and negative affective states was administered to 6,200 U.S. adults (49.0% male, 51.0% female). **Results:** Mean negative and positive affect were significantly elevated among protective firearm owners (i.e., those who kept firearms for the primary purpose of self-protection) and participants intending to acquire a firearm. Protective firearm owners intending to acquire another firearm reported significantly higher negative affect than all other subgroups. Within this subgroup, negative affect and positive affect were positively correlated. Among all other subgroups, negative and positive affect were either negatively correlated or uncorrelated. **Discussion:** The intention to acquire firearms and protective firearm ownership are associated with both positive and negative affectivity. Typical cognitive-affective processes may be disrupted among protective firearm owners intending to acquire another firearm.

Keywords: firearm, negative affect, positive affect, suicide

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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INTRODUCTION

From 1999–2018, firearm suicides increased in the U.S. by 15% (Kochanek, Murphy, Xu, & Arias, 2019). Firearms account for more than half of all U.S. suicides (Xu, Murphy, Kochanek, & Arias, 2020) and nearly two-thirds of all firearm-related deaths (Kochanek et al., 2019). Although research supports a positive correlation between firearm availability and suicide mortality, firearm owners nonetheless perceive that firearms increase, rather than decrease, their safety (Shepperd, Pogge, Losee, Lipsey, & Redford, 2018). Consistent with this general pattern, the majority of U.S. firearm owners cite self-protection as their primary motive for acquiring and maintaining a firearm (Carlson, 2005; Write, Rossi, & Daly, 1983). This self-protective motive may contribute to opposition from firearm owners specific to efforts aimed at reducing or limiting access to firearms, even though these measures are correlated with reduced suicide mortality (Anestis & Anestis, 2015; Cummings, Grossman, Rivara, & Koepsell, 1997; Loftin, McDowall, Wiersema, & Cottey, 1991). Firearms are correlated with suicide in large part because they render suicidal behavior more lethal, thereby increasing the probability of a suicide attempt being fatal (Conner, Azrael, & Miller, 2014). Firearms may also confer increased risk by influencing cognitive-affective vulnerabilities.

Although firearm availability is associated with increased risk for injury and mortality, many firearm owners nonetheless perceive that firearms decrease these risks (Shepard & Kay, 2018; Shepperd et al., 2018). According to the coping model of protective firearm ownership (Buttrick, 2020), this discrepancy may be explained by several psychological processes. First, firearm owners report higher levels of anxiety and are more likely to perceive the world as a dangerous place (Hauser & Kleck, 2013; Mencken & Froese, 2019; Stroebe, Leander, & Kruglanski, 2017). Although elevated anxiety contributes to firearm acquisition, firearm acquisition does not necessarily lower this anxiety (Hauser & Kleck, 2013), suggesting possible disruption of the behavioral inhibition system (BIS), a neural motivational system associated with trait anxiety, negative affectivity, and withdrawal or avoidance-related behaviors (Carver et al., 2000; Colder & O'Connor, 2004; Gray, 1987). From this perspective, firearm acquisition and ownership

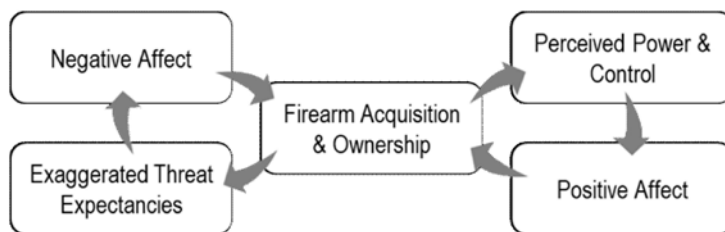


FIGURE 1. Dual affective processes associated with firearm acquisition and firearm ownership. Exaggerated threat expectancies (i.e., overestimations of danger) increase negative affect, which motivates firearm acquisition. Firearm acquisition simultaneously contributes to positive affect through increased perceptions of power and control, and to negative affect through exaggerated threat perceptions. Among protective firearm owners, both processes reinforce firearm ownership and the desire to acquire additional firearms.

can be conceptualized as avoidance behaviors motivated by the feedback loop on the left side of Figure 1.

Research has also found that firearm ownership and possession can confer a sense of power and control over the environment, especially in uncontrollable situations characterized by uncertain threat (Mencken & Froese, 2019; Shepard & Kay, 2018; Shepperd et al., 2018). Firearms therefore may promote positive emotional states even though they do not reduce negative emotional states. This process, depicted by the feedback loop on the right side of Figure 1, implicates the behavioral activation system (BAS), a second neural motivational system associated with positive affect and reward-driven behaviors (Gray, 1987; Leone & Russo, 2009; Smillie & Jackson, 2006). In combination, the dual processes depicted in Figure 1 suggest that firearm acquisition and ownership may paradoxically improve tolerance for anticipatory anxiety by fostering positive affectivity (the right side of Figure 1) while simultaneously maintaining—even exacerbating—negative affectivity (the left side of Figure 1).

The dual processes implicated by these separate lines of research have yet to be investigated in tandem. Such research could provide novel information about psychological processes that underlie firearm acquisition and ownership. Because negative affectivity also confers increased vulnerability to suicidal behavior, this research might also reveal clues that could inform firearm injury and mortality prevention efforts (e.g., use of safe

firearm storage practices). The purpose of the present study was to conduct a series of tests designed to evaluate our hypothesized model depicted in Figure 1. To this end, we tested the following hypotheses in a large, cross-sectional survey of U.S. adults:

1. Negative affect will be significantly higher among participants reporting an intention to acquire a firearm within the next 12 months as compared to participants who do not report this intention. If observed, this would support the assertion that negative affect motivates firearm acquisition.
2. Negative affect will be significantly higher among participants who acquired firearms for the purposes of self-protection (termed *protective firearm owners*) as compared to non-firearm owners and firearm owners who acquired firearms for purposes other than self-protection (termed *non-protective firearm owners*). If observed, this would support the assertion that firearm acquisition and ownership does not reduce negative affect.
3. Negative affect will be highest among protective firearm owners who also report an intention to acquire a firearm within the next 12 months. If observed, this would support the assertion that negative affect and firearm acquisition/ownership are mutually reinforcing.
4. Positive affect will be significantly higher among participants reporting an intention to acquire a firearm within the next 12 months as compared to participants who do not report this intention. If observed, this would support the assertion that positive affect motivates firearm acquisition.
5. Positive affect will be significantly higher among protective firearm owners as compared to non-firearm owners and non-protective firearm owners. If observed, this would support the assertion that firearm acquisition and ownership increases positive affect among certain types of firearm owners.
6. Positive affect will be highest among protective firearm owners who also report an intention to acquire a firearm within the next 12 months. If observed, this would support the assertion that positive affect and firearm acquisition/ownership are mutually reinforcing among certain types of firearm owners.

7. Positive and negative affect will be negatively correlated except among protective firearm owners reporting an intention to acquire a firearm within the next 12 months. If observed, this would support the assertion that positive affect does not offset or counteract negative affect among certain types of firearm owners.

METHOD

PARTICIPANTS AND PROCEDURES

Participants included 6,200 U.S. adults recruited via Qualtrics Panels using quota sampling methods to approximate ($\pm 10\%$) 2010 U.S. census data with respect to age, gender, race, ethnicity, and income level. Panel members received an email invitation with an embedded hyperlink to complete the online survey. Clicking the link opened up the survey's landing page, which provided information about the study's purpose, risk and benefits, and contact information for the researchers. Panel members were required to click a button indicating they had read and understood this information in order to begin the survey. Consent to participate was implied by completing this step. Participants who completed the survey in full subsequently received compensation in the amount they agreed to when signing up for the survey panel (e.g., points that could be turned in for cash, frequent flier miles). This study's procedures were reviewed and approved by the University of Utah Institutional Review Board, and were performed in accordance with the ethical standards outlined in the 1964 Declaration of Helsinki and its later amendments.

INSTRUMENTS

International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF). The I-PANAS-SF (Thompson, 2007) is a 10-item self-report scale that assesses positive affectivity and negative affectivity. Respondents are presented with a list of single-word mood states and asked to rate the extent to which they experience each using a 5-point scale ranging from 1 (very slightly or not at all) to 5 (extremely). Positive affect items were determined, attentive, alert, inspired, and active. Negative affect items were

afraid, nervous, upset, ashamed, and hostile. Item ratings are summed to provide overall subscale scores, with higher scores indicating more intense levels of each affective state. Cronbach's alphas for both subscales were above 0.82.

Firearm Ownership. All participants were presented with the following item from the Behavioral Risk Factor Surveillance Study (Centers for Disease Control and Prevention, 2005): "Do you currently have a firearm in or around your home?" Response options included no, yes, or prefer not to answer. Participants who selected yes were subsequently asked the following: "What are your reasons for keeping a firearm at home?" Participants were then presented with a list of 11 possible reasons and were instructed to select all that applied. Participants were then asked to identify the response that reflected their primary reason for keeping a firearm at home. Participants were categorized as protective firearm owners if they identified either personal safety or protection at home or personal safety or protection away from home. Participants selecting any other reason were categorized as non-protective firearm owners. All participants, regardless of firearm ownership status, were also asked, "Are you planning to acquire a firearm in the next 12 months?" Response options included no, yes, haven't decided yet, or prefer not to answer.

DATA ANALYSES

Analysis of variance (ANOVA) was used to test hypotheses 1 through 6. Separate models were constructed for positive and negative affect as outcomes, with firearm group and acquisition intention group entered as between-participant factors. For hypothesis 3 and 6, the interaction of firearm group and acquisition intention group was specified and tested. For hypothesis 7, we used generalized linear modeling with positive affect as the outcome variable. We computed interaction terms among negative affect, firearm group, and acquisition intention group and entered them as predictor variable along with the main effects for each variable. Biological sex and age were included as covariates in each model. We used SPSS version 25 for all analyses with a two-tailed $\alpha < .05$. For each analysis, we had >99% statistical power to detect small effects.

RESULTS

Participant demographic descriptors are summarized in Table 1. The majority ($n = 3729$, 60.1%) of participants reported no firearms in or around their homes, 2311 (37.3%) reported having a firearm in or around their home, and 160 (2.6%) declined to answer this question. The majority ($n = 4043$, 65.2%) of participants reported no intention to acquire a firearm, 793 (12.8%) reported an intention to acquire a firearm, and 1,292 (20.8%) reported being undecided about firearm acquisition. Among participants reporting a firearm in or around their home (i.e., firearm owners), 941 (40.7%) identified self-protection as their primary reason for firearm ownership. The mean negative affect score was 10.1 ($SD = 4.7$) and the mean positive affect score was 16.6 ($SD = 4.4$); these two variables were weakly correlated with each other ($r = -0.06$, $p < .001$). Participants who declined to answer the firearm ownership question were excluded from subsequent analyses.

HYPOTHESIS 1: NEGATIVE AFFECT AND FIREARM ACQUISITION INTENTION

Negative affect significantly differed across acquisition intention groups, $F(2,6123) = 79.6$, $p < .001$). Mean negative affect among participants intending to acquire a firearm ($M = 12.4$, $SD = 5.7$) was significantly higher than participants with no intentions to acquire a firearm ($M = 9.6$, $SD = 4.5$, $d = 0.58$, $p < .001$) and participants who were undecided ($M = 10.0$, $SD = 4.4$, $d = 0.48$, $p < .001$). Participants with no intentions and participants who were undecided did not significantly differ from each other ($d = 0.08$, $p = .769$).

HYPOTHESIS 2: NEGATIVE AFFECT AND FIREARM OWNERSHIP

Negative affect significantly differed across firearm groups, $F(2,6035) = 37.9$, $p < .001$). Mean negative affect among protective firearm owners ($M = 11.4$, $SD = 5.4$) was significantly

TABLE 1. Sample Characteristics and Descriptors

	<i>n</i>	%
Biological sex		
Male	3,038	49.0
Female	3,162	51.0
Race		
American Indian / Alaska Native	288	4.6
Asian	861	13.9
Black	770	12.4
Native Hawaiian / Pacific Islander	62	1.0
White	4,041	65.2
Other	448	7.2
Ethnicity		
Hispanic / Latinx / Spanish origin	919	14.8
Age		
18–24	643	10.4
25–44	2,530	40.8
45–64	1,993	32.1
65+	1,034	16.7

higher than non-firearm owners ($M = 9.5$, $SD = 4.6$, $d = 0.39$, $p < .001$) and non-protective firearm owners ($M = 9.9$, $SD = 4.6$, $d = 0.31$, $p < .001$). Non-firearm owners and non-protective firearm owners did not significantly differ from each other ($d = 0.10$, $p = .374$).

HYPOTHESIS 3: NEGATIVE AFFECT AND ACQUISITION INTENTION BY FIREARM OWNERSHIP INTERACTION

The interaction of acquisition intention group and firearm ownership group was statistically significant, $F(4,5988) = 13.3$, $p < .001$). Protective firearm owners who intended to acquire another firearm reported a significantly higher level of negative affect than all other subgroups (d 's = 0.48–1.03, p 's < .001). Mean subgroup scores are plotted in Figure 2.

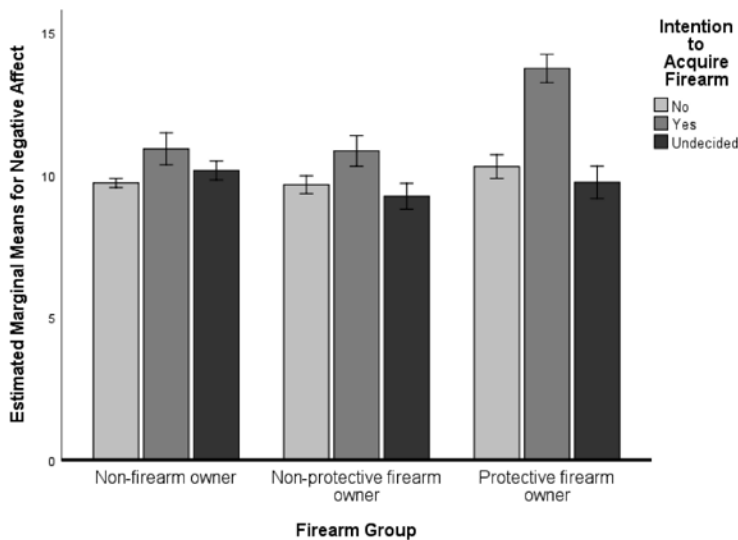


FIGURE 2. Mean negative affect scores, with 95% confidence intervals, by firearm ownership group crossed with firearm acquisition intention group

HYPOTHESIS 4: POSITIVE AFFECT AND FIREARM ACQUISITION INTENTION

Positive affect significantly differed across acquisition intention groups. $F(2,6123) = 51.3, p < .001$). Mean positive affect among participants intending to acquire a firearm ($M = 17.9, SD = 4.7$) was significantly higher than participants with no intentions to acquire a firearm ($M = 16.2, SD = 4.4, d = 0.37, p < .001$) and participants who were undecided ($M = 17.0, SD = 4.6, d = 0.20, p < .001$). Participants who were undecided reported significantly higher positive affect than participants with no intentions to acquire a firearm ($d = 0.18, p < .001$).

HYPOTHESIS 5: POSITIVE AFFECT AND FIREARM OWNERSHIP

Positive affect significantly differed across firearm groups, $F(2,6035) = 31.5, p < .001$). Mean negative affect among protective

firearm owners ($M = 17.6$, $SD = 4.6$) was significantly higher than non-firearm owners ($M = 16.2$, $SD = 4.4$, $d = 0.30$, $p < .001$) and non-protective firearm owners ($M = 16.9$, $SD = 4.4$, $d = 0.16$, $p < .001$). Non-protective firearm owners reported significantly higher positive affect than non-firearm owners ($d = 0.14$, $p = .001$).

HYPOTHESIS 6: POSITIVE AFFECT AND ACQUISITION INTENTION BY FIREARM OWNERSHIP INTERACTION

The interaction of acquisition intention group and firearm ownership group was not statistically significant, $F(4,5988) = 1.0$, $p = .398$).

HYPOTHESIS 7: ASSOCIATION OF POSITIVE AND NEGATIVE AFFECTIVE STATES ACROSS FIREARM SUBGROUPS

The three-way interaction of negative affect, firearm ownership, and acquisition intention was statistically significant, Wald $\chi^2(4) = 22.2$, $p < .001$. To facilitate interpretation, we decomposed the interaction term to examine the simple slopes by firearm ownership and acquisition intention groups. Results are summarized in Table 2. Across all firearm groups, negative affect was inversely correlated with positive affect among participants who were not intending to acquire a firearm or were undecided about doing so; the only exception was a nonsignificant inverse correlation among non-firearm owners who were undecided about firearm acquisition. Among those intending to acquire a firearm, however, the correlation between negative affect and positive affect significantly differed across firearm groups: negative affect was not significantly correlated with positive affect for non-firearm owners and non-protective firearm owners, but was positively correlated with positive affect among protective firearm owners.

DISCUSSION

Prior research suggests that both negative and positive cognitive-affective processes are associated with firearm acquisition

TABLE 2. Simple Slopes for the Association of Negative Affect with Positive Affect, by Firearm Group Crossed with Acquisition Intention Group

Intention to acquire firearm in next 12 months	Non-firearm owner		Non-protective firearm owner		Protective firearm owner	
	<i>B</i> (<i>SE</i>)	<i>p</i>	<i>B</i> (<i>SE</i>)	<i>p</i>	<i>B</i> (<i>SE</i>)	<i>p</i>
No	−0.10 (0.02)	<.001	−0.09 (0.04)	.014	−0.12 (0.05)	.012
Yes	−0.04 (0.06)	.492	0.05 (0.05)	.381	0.18 (0.04)	<.001
Undecided	−0.07 (0.04)	.079	−0.15 (0.06)	.006	−0.34 (0.07)	<.001

and ownership. To our knowledge, the present study is the first to investigate these dual processes simultaneously. Our results were generally consistent with expectations, lending support to the possibility that cognitive-affective states and firearm ownership are mutually reinforcing and may confer psychological vulnerability to firearm-related injury and mortality, notably suicide.

We first found significantly elevated levels of both negative and positive affect among participants reporting the intention to acquire a new firearm. Previous studies have similarly reported a correlation between negative affect with firearm acquisition (Hauser & Kleck, 2013; Stroebe et al., 2017), which supports the perspective of firearm acquisition and ownership as coping strategies for negative affectivity, especially elevated anxiety. Our finding that positive affect was also elevated among participants intending to acquire a firearm may seem to contradict these patterns, but an alternate possibility is that thinking about firearm acquisition and/or imagining having possession of a new firearm elicits positive cognitive-affective states such as feeling powerful and/or having control over uncertain situations (Shepard & Kay, 2018; Shepperd et al., 2018). Firearm acquisition may therefore be most probable among anxious and/or fearful individuals who experience positive affect when thinking about obtaining a firearm. Longitudinal research that assesses cognitive-affective states before and after firearm acquisition are needed to further test this possibility.

Our results also showed that protective firearm owners reported higher levels of negative affect, a pattern that converges with the coping model of protective firearm ownership (Buttrick, 2020),

which hypothesizes that firearm owners motivated by the desire for self-protection have elevated levels of anticipatory anxiety and exaggerated threat expectancies. This perspective is bolstered by two additional findings. First, negative affect was significantly higher among protective firearm owners as compared to other firearm owners. Second, non-protective firearm owners did not differ from non-firearm owners. We also found that protective firearm owners reported higher levels of positive affect, even as compared to non-protective firearm owners, a pattern that aligns with previous reports (Shepard & Kay, 2018; Shepperd et al., 2018). In combination, these findings suggest that negative and positive affect do not vary as a function of firearm ownership per se, but rather as a function of self-protective motives, which may reflect BIS sensitivity.

The patterns described in the preceding paragraphs were magnified when considering the overlap of acquisition intentions and firearm group. Of note, protective firearm owners who intended to acquire additional firearms had markedly elevated negative affect, which may confer increased vulnerability to suicidal behavior. Within this subgroup, positive and negative affect were also positively correlated instead of being negatively correlated. Positive affective states are believed to provide a protective function by buffering or undoing the effects of negative affective states (Davidson, Jackson, & Kalin, 2000). The reverse pattern observed among the protective gun owners in our sample raises the possibility that typical cognitive-affective processes are disrupted among individuals intending to acquire a firearm, and may be altered among those who are also protective firearm owners. This may, for instance, implicate BIS sensitivity combined with BAS sensitivity, which could lead to impulsive behaviors associated with an exaggerated preference for immediate rewards, a decision-making style that has been observed among individuals who have attempted suicide (Dombrovski, Szanto, Clark, Reynolds, & Siegle, 2013; Jollant et al., 2010).

In light of several limitations to our study, conclusions based on the present findings should be made cautiously until they can be replicated and/or confirmed using complementary assessment methods. For instance, we used only self-report methods in the present study, which can be vulnerable to response bias.

Future research using objective assessment methods (e.g., neuroimaging, psychophysiological measures, behavioral tasks) would temper concerns related to the self-report methods used here. The cross-sectional design of our study is another limitation that hinders our ability to establish temporal and/or directional associations among affective states, firearm acquisition, and firearm ownership. Longitudinal studies are needed to more clearly understand these processes. Our use of a state measure of affect—although valuable in its alignment with our assessment of momentary intention to acquire a firearm—could also be seen as a limitation in that it is unclear to what extent these group differences represent persistent patterns or to what extent lability in affective state may impact our model. Future research that also uses trait measure of affect and which assesses volatility in affective states would add clarity on these points. Finally, we did not assess other dimensions of firearm ownership that may be relevant. Carrying a firearm on a regular basis, for instance, might also be associated with the cognitive-affective processes under investigation in this study. Despite these limitations, our results provide novel information about psychological processes associated with firearm acquisition and ownership, and support the potential merit of biobehavioral processes underlying the association of firearm availability and suicide mortality.

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