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Abstract

Prior research shows the effects of sexism can accumulate over time, resulting in severe negative, cognitive, affective, motivational, and physiological consequences for women; however, most research focuses on the consequences of being a direct target of sexism, and the cognitive and motivational consequences of being a witness of sexism have not yet been fully explored. Additionally, while it is thought that allyship can help mitigate the consequences of sexism, minimal research has tested this relationship. It was proposed that shifts in reactive approach motivation (RAM); aimed to protect against anxiety and negative affect, may direct attention away from goal-oriented behaviors, inhibiting performance and self-regulation on current cognitive tasks. The study also investigated whether allyship acts as a protective factor against these impairments. Participants watched a Zoom interaction during which sexism occurs and the presence of an ally is manipulated (i.e., with allyship, without allyship). Participants completed self-report measures of state anxiety and negative affect and then were asked to sit quietly for five minutes, during which alpha hemispheric activity was recorded. After the session, participants completed a self-report measure of state approach motivation (i.e., BAS) and completed a cognitive task assessing an electrophysiological index of self-regulation (i.e., ERN amplitudes), proportion of correct responses and response times. Results indicated that witnessing sexism negatively impact women's cognitive functioning and self-regulations, similarly, to being a direct target of sexism. Results investigating the effects of allyship were inconclusive. These results do not support prior research suggesting that allyship positively impacts those who experience sexism.

Do Allyship and Motivation Influence Cognitive Functioning and Self-Regulation After Witnessing Sexism?

Society has made significant strides toward equality in the last century, with blatant expressions of discrimination against women in male-dominated fields becoming less accepted (Czopp et al., 2015; Ellemers & Barreto, 2015). Since the creation of the Civil Rights Act of 1964, employers are required to provide equal employment opportunities for their workforce, aimed to protect women and people of color from discriminatory practices in the workplace. Since then, women's representation in the workplace has slowly increased, with women's employment in male-dominated fields increasing by 5.0% between 2016 and 2018 (Kolko & Miller, 2018), and with 50% of all U.S. women now holding jobs (U.S. Bureau of Labor Statistics, 2020).

Sexism.

Despite the increasing prevalence of egalitarian views, and the decreasing acceptance of explicit sexism, which is the overt beliefs or actions toward women, many individuals still harbor implicit stereotypes and prejudices against women within male-dominated fields (Cyr et al., 2021). Implicit stereotypes are unconscious beliefs that do not appear outwardly negative but still underlie the traditional, stereotypical views that women are inferior to men (Greenwald & Pettigrew, 2014; Kuchynka et al., 2018; Szymanski & Henrichs-Beck, 2014). Implicit sexist stereotypes are distinct in that they are often prescriptive, as well as descriptive, meaning they indicate beliefs about what women *should* be like as opposed to only indicating beliefs about what women *are* like (Kassin, 2021). These implicit beliefs create behavioral expectations for women in the workplace (Blanchard-Kyte et al., 2017). Women are expected to display stereotypical

feminine characteristics such as sensitivity to others, humility, and cooperation and are overtly expected to avoid displaying stereotypical masculine characteristics like dominance, control, intimidation, and arrogance (Prentice & Carranza, 2002; Szymanski & Henrichs-Beck, 2014). These gender roles and stereotypes create workplace environments that often favor men (Ridgeway & Correll, 2004), fostering the belief that women are more communal and nurturing and that men are more independent and competitive; characteristics that people associate with being successful in most male-dominated careers (Gupta et al., 2018). These stereotypes not only influence the views of men within these fields but can affect women's views about their self-efficacy, which is the belief about one's capacity to execute behaviors necessary to attain their goals (Bandura, 197), and make it difficult for women to feel they belong in male-dominated environments (Milkman et al., 2015; Ridgeway & Correll, 2004).

Implicit Sexism

The societal shift away from explicit sexism to implicit sexism has made sexist actions more ambiguous and by extension more socially acceptable (Biernat, 2009). This ambiguity makes it difficult to determine if slights should be perceived as negative or discriminatory. Common forms of implicit or subtle sexism include sexual objectification, sexist humor, assumptions of inferiority, social exclusion, and discriminatory hiring practices (Capodilupo et al., 2010; Fouad et al., 2016; Lewis, 2018). These subtle forms of discrimination frequently manifest when attempting to articulate something positive. Men who display benevolent sexism believe they hold positive regard towards women and overlook the inherent patronization of their actions (Glick & Fiske, 1997). An example of benevolent sexism is when a woman is told that she does not

"look like" an engineer (Lewis et al., 2019; Meadows & Sekaquaptewa, 2013), the initial comment may have positive intentions; however, it is supporting the underlying gender stereotype that only men or masculine women are assumed to be engineers (Sekaquaptewa, 2019).

Men who display implicit sexism are viewed more positively than men who display explicit sexism (Ellemers & Barreto, 2015), as they do not fit the prototypical sexist man showing explicit sexism. As a result, compared to explicit sexism, individuals do not consider implicit sexism as a type of discrimination and thus it often goes unnoticed and is harder to directly address (Ellemers & Barreto, 2015). Women even personally endorse benevolent sexism and enjoy the "privileges" it entails (e.g., protection from men; Glick & Fiske, 2001). However, research shows subtle forms of sexism are more harmful than overt sexism because of the ambiguity it causes (Thomas, 2017). The current study is interested in facilitating the success of women in male-dominated fields; thus, it aims to investigate how sexism interferes with women's performance within these environments.

Reactive Approach Motivation (RAM)

A reactive approach motivation (RAM) perspective proposes that in threatening environments where uncertainty and ambiguity are high, like that involving implicit sexism, individual's anxiety and negative affect increase (McNaughton & Gray, 2000). To alleviate and protect against the heightened anxiety and negative affect, motivation shifts occur, directing behavior away from an initial goal, such as goals related to the environment, to abstract alternative goals or cherished ideals, such as relationship goals or weekend plans (Harmon-Jones & Gable, 2008). These alternative goals and cherished

ideas are relatively free from the risk of failure, unlike the present focal goal, thus the motivational shift is thought to provide protection from the high levels of anxiety created by the threatening environment (McGregor et al., 2010). However, the motivational shift creates tunnel vision, focusing one's attention and intentions on just alternative goals and not on original tasks associated with the threatening environment. While the focus on alternative goals may offer immediate relief from anxiety and negative affect, the absorption in an alternative goal is also related to potentially longer-term consequences for the individual (Leota, 2020; McGregor et al., 2010). Individuals who experience the shift in motivation towards alternative goals experience decreased responses to adverse stimuli (Nash et al., 2012), show decreased sensitivity to negative outcomes (Gianotti et al., 2009), and become less self-regulated (Leota, 2020). This decreased response sensitivity may hinder an individual's ability to tackle present stressors (Gianotti et al., 2009; Nash et al., 2012).

In line with the RAM perspective, the subtlety of sexism and the (usually) positive intentions of the perpetrator of sexism make it difficult for women to evaluate interactions with men in male-dominated fields, rendering it difficult to directly address the perpetrator to resolve the issue, thus increasing the likelihood of negative psychological states (e.g., anxiety; Lewis, 2018). This attributional ambiguity, which is the uncertainty about whether the treatment one receives is a result of individual performance or an indicator of social prejudices against the stigmatized group to which one belongs (Major et al., 2003), leads targeted individuals to try and decipher whether the perpetrator's intentions were discriminatory or not (Bain, 2020; Dovidio, 2001). After a sexist interaction, rumination, which is the passive reflection on one's distress and

circumstances surrounding the distress, may cause individuals to devote more time and cognitive resources to processing the discriminatory interaction (Treynor et al., 2003).

The effort of deciphering the perpetrator's intentions creates high cognitive loads, increases anxiety, and results in more negative affect (Dardenne et al., 2007; Delacollette et al., 2013; Mendes et al., 2008). To protect themselves from these unwanted psychological consequences, women may motivationally switch their attention to more rewarding alternative goals or more cherished ideals, reducing one's attention on environment-related tasks and thus decreasing performance and disrupting one's ability to self-regulate and perform at one's full potential on tasks within the threatening environment.

Consequences of Sexism

Targets of Sexism

Compared to women who do not experience sexism, women who are targets of sexism report higher stress, anxiety, depression, lower self-esteem, and lower achievement in several domains (Dardenne et al., 2007; Sarlet et al., 2012; Swim et al., 2001). Targets of sexism also experience physiological consequences. Women who experience sexism display cardiovascular threat responses after sexist interactions (Casad & Petzel, 2018; Lamarche et al., 2020), and longer cardiovascular recovery times on demanding insight tasks (i.e., remote associates test) following sexist remarks, compared to baseline (Salomon et al., 2015). These consequences show exposure to sexism is impactful and creates the negative consequences that may ultimately lead to a shift in motivation. Additionally, women display impaired cognitive performance when completing a cognitive task after being direct targets of sexism (Jones et al., 2014;

Yamamoto & Ohbuchi, 2011), and the exposure decreases working memory capacity (Schmader & Johns; 2003; Schmader et al., 2008). According to the RAM perspective, the negative psychological and physiological consequences of sexism, shift women's motivation, resulting in the impaired cognition on present tasks.

Witnessing Sexism

When sexism is expected in an environment, like those in male-dominated workplaces, women are not only frequently the direct targets of sexism, but they are more often witnesses to these behaviors, observing sexist remarks or comments directed to other women (Good et al., 2012; Ong et al., 2011; Settles et al., 2006). While observing sexism may seem trivial to the individual, and thus harmless, prior research has found that effects of indirect discrimination can accumulate over time, leading to consequences similar to direct targets (Jones et al., 2017). Therefore, it is important for research to investigate the effects of witnessing sexism, thereby providing a more well-rounded perspective to the plethora of research on the direct targets of sexism.

Research on witnessing sexism suggests that being a witness to sexism has similar negative impacts as being a direct target. Women who are indirectly exposed to sexual harassment in work environments experience comparable effects as the direct targets of the harassment, such as lower job satisfaction, and more work-related withdrawal (Glomb et al., 1997). This finding demonstrates sexism can create a stressful environment for all the men and women who are involved, not just for the target. Furthermore, research shows watching another woman being treated in a sexist manner decreases the witnesses' sense of belonging in male-dominated fields (e.g., physical science, math) and makes women more likely to question women's overarching performance in those fields

(LaCosse et al.,2016). Research finds that women who witness sexism through workplace inequity also experience lower self-esteem and career aspirations (Bradley-Geist et al., 2015). Women may believe that they too will also face similar barriers as the target of the sexist remark. This belief may be what leads to these negative psychological consequences. This research suggests that witnessing sexism is similarly impactful to being a direct target of sexism, and that witnessing sexism may create the negative psychological consequences needed to shift one's motivation towards alternative tasks that ultimately leads to poor performance.

To our knowledge, no research has examined how witnessing sexism impacts cognitive performance. However, it is believed that similar relationships may be present among individuals who are witnessers to sexism, as they too must try and decipher if the perpetrator's intentions were discriminatory towards another member of their group, potentially making them vulnerable to the same negative cognitive consequences and motivational shifts that direct targets face (Ozier et al., 2019). In line with the RAM perspective, while not the direct targets of sexism, women who witness the sexist treatment of other women may try to decipher the ambiguous remarks, thus creating negative psychological states, and ultimately shifting motivation which impairs cognitive performance. This interaction will similarly interfere with a woman's ability to self-regulate, impairing her ability to perform at her highest level.

Due to the limited research on the consequences of witnessing sexism, which has focused primarily on the psychological effects of observing sexism, the current investigation must partly rely on the race literature to infer how sexism may cognitively impact observers. Research on the negative effects of witnessing racism on cognitive

functioning shows that individuals who observed racist hiring practices performed worse on a cognitive task (Salvatore & Shelton, 2007) and working memory tasks (Ozier et al., 2019) compared to individuals who did not observe racism. Furthermore, research with Latinx participants showed that they demonstrated impaired inhibition on a Stroop task after witnessing subtly biased interactions (Murphy et al., 2013). These negative consequences of racism may be partly due to shifts in approach motivation aimed to protect the individual from the psychological consequences of racism.

While previous research on racism is important in adding to our understanding of how witnesses are cognitively impacted by prejudice, the cognitive effects women may face after being witnesses to sexism have yet to be explored. Furthermore, the previous studies focus on written manipulations of observing sexism, for example, reading a vignette about someone who experiences sexism, and do not address how visually experiencing someone being treated in a sexist manner, which is a more common experience in daily life, may affect the observer. Research indicates video portrayals are more impactful than written vignettes (Pietri et al., 2020), thus visually witnessing sexism may affect an observer more than previous research suggests. The current study aimed to investigate whether visually (i.e., video) witnessing sexism impairs cognitive functioning and ultimately evaluate whether these impairments are due to high levels of negative psychological reactivity and motivational shifts in approach motivation.

Self-Regulation

Women who witness sexism may also experience impaired self-regulation in addition to cognitive dysfunction. Two models of self-regulation explain the mechanisms underlying deficits in self-control. The strength model of self-regulation suggests

regulation depends on a set number of cognitive resources and that high cognitive load depletes the resources needed for successful self-control (Baumeister et al., 1998). Consistent with the strength model of self-control, women who are under high cognitive loads due to witnessing sexism may deplete the cognitive resources needed for successful self-control and enhanced performance.

Alternatively, the process model of self-regulation suggests that high cognitive loads do not deplete cognitive resources but reallocates them, shifting one's motivation away from self-regulation to more rewarding or positive behaviors (Inzlicht & Schmeichel, 2012). One may tire of the constant self-regulation and thus switch their cognitive resources to tasks which are less demanding. Consistent with the process model of self-regulation, the motivations of women who witness sexism may shift away from self-regulation and performance monitoring to more enjoyable thoughts or tasks as a coping response, especially if they think the expected performance is unattainable. The process model of self-regulation is in line with the RAM perspective; as it too suggests that motivation shifts impact performance; therefore, the current study aimed to investigate whether witnessing sexism influences motivation shifts resulting in reduced self-regulation.

Error-related negativity

Studies using electroencephalography (EEG) identified the event-related potential (ERP) component of error-related negativity (ERN) as reflecting activation of the anterior cingulate cortex (ACC), which is associated with conflict monitoring and self-regulation (Posner et al., 2007; Yeung et al., 2004). The ERN is a response-locked ERP component with a negative deflection occurring at the frontal-central region of the

scalp between 50-80 milliseconds after a response (Dehaene et al., 1994). The ERN is associated with one's ability to detect errors and an inability to exert self-control (Overmeyer et al., 2021), and is identified as either being a reinforcement learning index of error detection (Holroyd & Coles, 2002) or an early indicator of response conflict in association with errors in task performance (Yeung et al., 2004).

Prior research shows higher amplitudes of the ERN are associated with more significant distress related to making errors (Nash et al., 2012) and are present when the individual makes an error, suggesting greater error detection (Inzlicht & Gutsell, 2007; West, 2004). Additionally, higher ERN amplitudes are related to more behavioral self-control (Oermeyer et al., 2021) and more deliberate response styles (Gehring, 1993). Individuals who demonstrate poor performance on cognitive tasks, as measured by slower response times and more error rates, who then exert greater self-control to perform better, display a more conservative style of responding to reduce future errors in behavior which leads to greater amplitudes of ERN (Bartholow & Amodio, 2009). Additionally, prior research shows that depleted self-control is related to lower ERN amplitudes (Inzlicht & Gutsell, 2007).

A common research practice is to compare ERN amplitudes for incorrect and correct responses on incongruent trials (Riesel et al., 2013). Self-regulation is not needed on congruent trials of the Stroop task because the word and color do not contradict. Additionally, correct responses do not elicit error detection or a need for greater self-regulation (Riesel et al., 2013). Given that self-control and error detection are not required for correct responses, similar ERN amplitudes for incorrect responses and correct responses would suggest limited self-regulation and error detection. Therefore,

individuals who have impaired self-control are expected to have smaller differences in ERN amplitudes between incorrect and correct responses on incongruent trials. Individuals with greater self-control ability are expected to have larger differences, between incorrect and correct responses on incongruent trials (Larson & Clayton, 2010; Overmeyer et al., 2020; Riesel et al., 2013).

The proposed study aims to investigate the cognitive consequences of being a witness of sexism by using ERN amplitude differences between incorrect and correct responses on incongruent trials, as a measure of error detection and self-control.

Approach Motivation

Consistent with the RAM perspective and the process model of self-regulation, it is proposed that motivation shifts account for the deficits in cognitive performance and self-regulation failure after being a direct target or witness of sexism. Therefore, the present study must account for motivation when assessing the relationship between witnessing sexism and cognitive impairment and self-regulation failure. Many motivational models posit the approach and avoidance systems are important for guiding individual behavior. The approach system directs our behavior toward rewarding stimuli and positive outcomes, whereas the avoidance system directs our behavior away from punishing, non-rewarding stimuli (Harmon-Jones et al, 2013).

After appraising a threatening stimulus, both systems enervate the body to respond accordingly (Elliot, 2006). Upon experiencing uncertainty, one’s behavioral inhibition motivational system (BIS) inhibit actions toward current goals and one’s behavioral activation motivational system (BAS) shifts attention to more rewarding goals (Kruglanski et al., 2002; McNaughton & Grey, 2000; Nash et al., 2012). The initial threat

(e.g., sexism) causes the individual to experience anxiety and uncertainty resulting in the activation of BIS to disengage in the present task. BAS then engages the individual's attention to a supplementary goal or ideal (e.g., relationship goals, weekend plans) to relieve the avoidance-related anxiety (Nash et al., 2011). The engagement of the BAS is thought to result in less attention towards the task-relevant goal and may lead to impaired cognitive performance and self-regulation on current tasks (McGregor et al., 2010; Leota, 2020).

In support of the RAM perspective and the process model of self-regulation, prior research shows brain activity associated with approach motivation predicts decreased behavioral and neural reactivity to anxiety inducing stimuli (Nash et al., 2011). Additionally, individuals higher in trait approach motivation show deficits in self-control and error detection (Inzlicht & Schmeichel, 2012; McGregor et al., 2009; Nash et al., 2012) and individuals higher in state approach motivation (i.e., RAM) decreases attention towards anxiety provoking stimuli (Xu & McGregor, 2018; Leota, 2020).

Women who are witnesses of sexism may display a shift in RAM, directing their attention away from threat to more abstract goals or cherished ideas (e.g., relationship goals, weekend plans). This decreased attention, may result in poorer performance on initial-goal related tasks. For example, a woman who witnesses sexism may direct her attention away from the sexist interaction and instead transfer her attention to more rewarding ideals (e.g., relationship goals, weekend plans). This focus on more rewarding stimuli may deter individuals' attention from initial goal-oriented behaviors and thus inhibit cognitive performance on subsequent tasks. The proposed study aims to

investigate whether motivational shifts mediate the relationship between witnessing sexism and cognitive performance and self-regulation deficits.

Cortical Asymmetries

Prior research has assessed approach and avoidance motivational responses using the self-reported measures of BAS and BIS (Carver & White, 1994). Specifically, the drive subscale of the self-reported BAS measure is used to measure state (i.e., reactive) approach motivation (Eftekhari et al., 2017; McGregor et al., 2010). However, more recently, alpha hemispheric activity differences have become commonly used markers of approach and avoidance motivation (Harmon-Jones et al., 2010). These hemispheric differences are assessed with neurophysiological indices, specifically hemispheric differences of alpha frequencies in the left compared to right prefrontal cortex (PFC). Greater left-hemispheric activity compared to right-hemispheric activity is associated with trait and state approach motivation (Harmon-Jones & Harmon Jones, 2011; McGregor et al., 2009; Smith et al., 2017). A common research practice for assessing state (i.e., reactive) approach motivation through alpha hemispheric activity is to covary for trait alpha hemispheric activity while analyzing state activity (McGregor et al., 2009). The proposed study aims to investigate whether negative psychological states, measured by self-report state anxiety and negative mood, and levels of RAM, measured by alpha hemispheric asymmetries and self-reported BAS serially mediate the relationship between witnessing sexism and cognitive performance and self-regulation deficits.

Allyship

As more subtle forms of sexism are ambiguous and can be interpreted in a positive or negative way, situational factors may influence how individuals interpret and

are affected by the sexist behavior. Allyship may be a protective situational factor leading to greater support for women in moments of discrimination. Even though allyship research is still in its infancy (Sabat et al., 2013), research suggests that having an ally, which is a person who is a member of a dominant or majority group who works to end oppression, may buffer the negative effects of being a target of prejudice or discrimination (Cheng et al., 2019; Johnson et al., 2019).

Effective Support

In the case of sexism, allyship pertains to an individual (i.e., man) supporting, providing psychological or tangible resources, or advocating outward displays of support for stigmatized individuals (Ji, 2007; Sabat et al., 2013), for women, and for gender equality (Drury & Kaiser, 2014; Rudman et al., 2012). For allyship to be effective, supportive or advocate behaviors should involve outcomes that advance women, stop discriminatory behavior, or make the women feel supported (Cheng et al., 2019). Supportive behaviors can include listening to individuals' struggles, participating in allyship training, and showing acceptance of stigmatized differences (Ruggs et al., 2011). Advocacy behaviors can include directly confronting instances of prejudice or making direct efforts to educate peers (Czopp & Monteith, 2003; Ruggs et al., 2011). For example, a man who actively calls out another man when he is 'talking over' (or mansplaining; Joyce et al., 2021) women colleagues in a meeting is considered an effective ally.

While research on the benefits of allyship is still new, allyship leads to positive overall change. Research on racism and with lesbian, gay, bisexual, transgender, and queer (LGBTQ) populations shows when an ally confronts discriminatory comments,

people react more negatively to the perpetrator of the discrimination compared to situations without ally support (Dickter et al., 2012; Drury & Kaiser, 2014). Ally support allows individuals to begin to recognize the unacceptable nature of the situation, thus empowering people to confront similar comments themselves in the future (Swim & Thomas, 2006). This resulting reaction may continue to snowball reaching many people, ultimately decreasing the acceptability of prejudice within one's social environment (e.g., workplace; Drury & Kaiser, 2014). Additionally, targets of discrimination may feel more comfortable speaking out and have a stronger belief that they will be taken seriously when they observe similar instances within that environment (Drury & Kaiser, 2014; Maranto & Griffin, 2011). Men allies serve a major role in making sexism less acceptable in social environments as they hold more credibility than women when confronting perpetrators of discriminatory behaviors due to lower vested interest (Drury et al., 2014), therefore they are more effective than women at reducing discriminatory actions against women (Drury et al., 2014).

Given the infancy of allyship research, little is known about how allyship directly effects the targets of sexism or other women observers, as most research has directed its attention to the ally and their ability to bring about behavioral change in perpetrators of biases. To our knowledge only a few studies have explored how ally support influences direct targets of sexism and no studies have examined the effects it has on the witnesses of sexism. Therefore, the present study aims to investigate the potential protective impact ally support has on the cognitive performance and self-regulation of women who observe sexism. It also aims to assess if the protective influence of the ally prevents motivation shifts that lead to impaired performance. In line with the RAM perspective, it was

proposed that an ally would offer protection against sexism by preventing the negative psychological reactivity (e.g., anxiety, negative mood) that sexism produces, thus limiting the need for other protective responses (e.g., shifts in RAM). Reducing shifts in RAM would allow women to maintain attention on current tasks within the threatening environment and allow them to perform at their highest level.

Proposed Study

The current study examines whether witnessing sexism impairs cognitive performance and self-regulation and whether psychological reactivity and RAM, defined as shifts towards abstract goals, serially mediate this relationship by increasing impairments on original tasks. When threatened, individuals may experience increased anxiety and negative mood, thus initiating RAM which directs women's attention away from the original goal-oriented behaviors to other rewarding goals or ideals aimed to protect against the psychological consequences of sexism. This shift in attention may inhibit performance on tasks performed in the threatening environment. The study investigates whether allyship acts as a protective factor against these impairments, proposing that allyship may prevent anxiety, negative mood, and shifts in RAM which ultimately lead to cognitive impairment.

The research consists of an online study and an in-person study. The purpose of the online study was to demonstrate that witnessing sexism is as cognitively impactful as directly experiencing sexism. It also ensured that witnessing sexism through an online paradigm is impactful enough to cause cognitive depletion and self-regulation failure. The online study tests the effectiveness of the manipulation of sexism used in the

experiment. The online study manipulation has three conditions consisting of a target of sexism, a witness of sexism, and a no sexism control.

The online study used performance measures of proportion of correct responses and response times on a cognitive task (i.e., Stroop) to measure cognitive impairment among groups (i.e., target, witness, control). It was expected that women who were direct targets of sexism or witness sexism would show greater cognitive impairment compared to women in the control condition who did not witness sexism, demonstrating that witnessing sexism has similar cognitive consequences to being a direct target of sexism and that the manipulation is impactful enough to detect these differences.

The in-person study focused on the electrophysiological effects of witnessing sexism and investigated the mediating relationship of psychological reactivity (i.e., state anxiety, negative mood) and reactive approach motivation (i.e., alpha hemispheric asymmetries, BAS). The experiment had two groups in which all women witness sexism, but the presence of an ally was manipulated. In the ally condition, participants were witnesses to a sexist interaction where a male ally confronts the perpetrator, and in the no ally condition, participants witnessed a sexist interaction without support from a man.

In addition to the Stroop performance measures used in the online study (i.e., proportion of correct responses, response latencies) the experiment used electrophysiological indices of self-regulation (i.e., ERN amplitude differences). The study also investigates the serial mediating effects of (first) psychological reactivity by assessing state self-reported measures of anxiety and negative mood. The study also investigated the serial mediating effects reactive approach motivation (second) by assessing state self-reported measures (i.e., BAS) and neurophysiological indices (i.e.,

alpha hemispheric asymmetries). It was predicted that women who are witness to a sexist interaction in which an ally demonstrated support for the target would show less anxiety and negative affect, reducing the shift in reactive approach motivation, and thus would continue to focus their attention on current goal-oriented behaviors, resulting in less cognitive impairment than women who were exposed to a sexist interaction without ally support.

Hypotheses

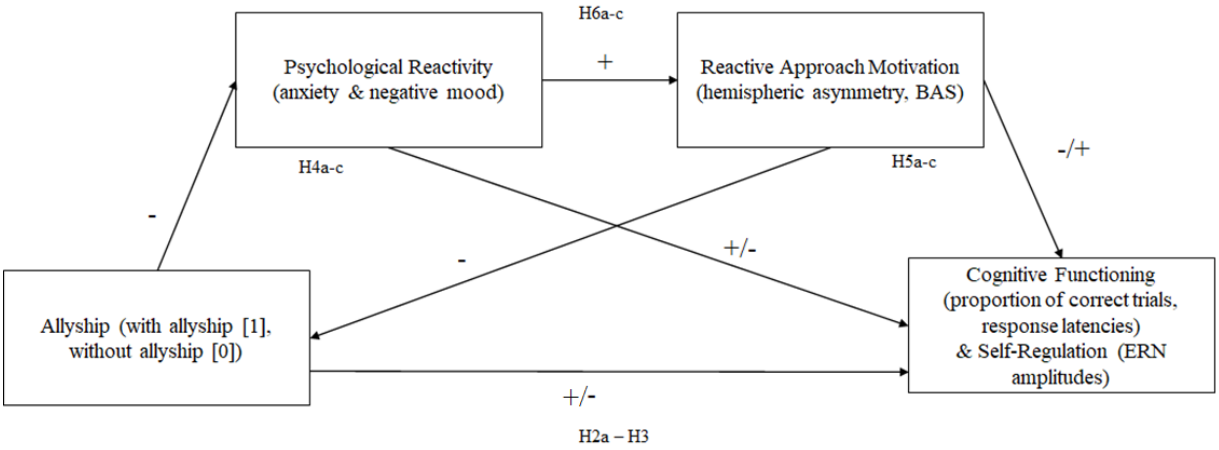
Online Study. It is expected that women who are targets, or witness of sexism will show (H1a) lower proportions of correct responses and (H1b) longer response times on a Stroop task compared to women in the control condition. We do not expect significant differences in cognitive impairment between women in the direct sexism or witness conditions (H1c).

In-Person Study. It is expected that women who witness a sexist interaction without ally support will demonstrate greater cognitive impairments, as measured by (H2a) low proportions of correct responses and (H2b) longer response latencies on a Stroop task, and will display greater self-regulation failure, as measured by (H3) smaller differences in ERN amplitudes on incorrect compared to correct responses on incongruent trials of a Stroop task, compared to women who witness a sexist interaction with an ally. It is hypothesized that psychological reactivity (i.e., state anxiety, state negative mood) will mediate the relationship between allyship condition (i.e., allyship, no allyship) and deficits in cognitive performance (i.e., proportions of correct responses, response latencies) and self-regulation (i.e., ERN amplitude differences), such that higher anxiety and negative mood in response to sexism without ally support will result in (H4a)

lower proportion of correct responses, (H4b) longer response latencies on a Stroop task, and (H4c) smaller ERN amplitude differences between incorrect and correct responses of incongruent trials of a Stroop task. These influences will be weaker in the sexism with ally support condition. It is hypothesized that reactive approach motivation (i.e., alpha hemispheric asymmetries, BAS) will also mediate the relationship between allyship condition (i.e., allyship, no allyship) and deficits in cognitive performance (i.e., proportion of correct responses, response latencies) and self-regulation (i.e., ERN amplitude differences), such that greater reactive approach motivation towards alternative goals in response to sexism without ally support will result in (H5a) proportion of correct responses, (H5b) longer response latencies on a Stroop task, and (H5c) smaller ERN amplitude differences between incorrect and correct responses of incongruent trials of a Stroop task. These influences will be weaker in the sexism with ally support condition. It is also hypothesized that psychological reactivity (i.e., state anxiety, state negative affect) and reactive approach motivation (i.e., alpha hemispheric asymmetries, state BAS) will serially mediate the relationship between allyship condition (i.e., allyship, no allyship) and deficits in cognitive performance (i.e., proportion of correct responses, response latencies) and self-regulation (i.e., ERN amplitude differences), such that greater psychological reactivity will result in an increase shift in reactive approach motivation toward alternative goals and result in (H6a) lower proportion of correct responses, (H6b) longer response latencies on a Stroop task, and (H6c) smaller ERN amplitude differences between incorrect and correct responses of incongruent trials of a Stroop task. These influences will be weaker in the sexism with ally support condition.

Figure 1

Hypothesized Serial Mediation Model



Note. Hypothesized serial mediational model of psychological reactivity and reactive approach motivation accounting for the relationship between allyship condition and cognitive functioning and self-regulation outcomes. It was proposed that allyship condition would be negatively related to cognitive functioning impairment and would be positively related to differences in ERN amplitude between incorrect and correct responses in incongruent trials. Allyship condition would negatively relate to psychological reactivity. Psychological reactivity would positively relate to cognitive functioning impairment and negatively relate to differences in ERN amplitude between incorrect and correct responses in incongruent trials. Allyship conditions would be negatively related to shifts in reactive approach motivation. Shifts in reactive approach motivation would positively relate to cognitive functioning impairment and negatively relate to differences in ERN amplitude between incorrect and correct responses in incongruent trials. Psychological reactivity would positively relate to shifts in reactive approach motivation.

Method

Participants

For the online study, a G*power analysis for a one-way Analysis of Variance (ANOVA) indicated approximately 81 participants are needed to detect significant group differences if there is a medium effect size (f^2 =.35; Cohen, 1988) at a 0.80 power level and an alpha level of .05. The expectation of a medium size effect is based off previous studies using similar designs (Grilli et al., 2020; Weber et al., 2020). For the in-person study a Monte Carlo power analysis for serial mediation indicated approximately 130 participants are needed to detect interaction effects at a .80 power level (Schoemann, Boulton & Short, 2017; Monte Carlo Power Analysis for Indirect Effects).

Participants of the online and in-person study were mutually exclusive, however, to make comparisons across studies, eligibility requirements for participants were the same for the online and in-person experiment. Participants were women, without a diagnosis of anxiety, depression, and color blindness, and could not be taking medications that affect the central nervous system (e.g., antidepressants, anxiolytics). Inclusion criteria also required participants to be between 18 to 35 years of age, right-handed, with no history of traumatic brain injury or neurological disorders, and with normal or corrected vision. Left-handed individuals were excluded due to the potential neurological differences between left-handed and right-handed people (Willems et al., 2014). Due to changes in brain activity caused by aging, participants who are 36 years or older were also excluded from the study (Salthouse, 2009). While older individuals may have more experience with dealing with sexism over the years, many of these experiences may have involved overt sexism. Younger individuals may have more experience dealing

with ambiguous forms of sexism; the form of sexism being investigated in the current study. Normal or corrected to normal color vision is required to perform the Stroop task.

Participants for the online study (N = 81) were recruited from Amazon Mechanical Turk (Mturk; Seattle, Washington) by CloudResearch (formerly TurkPrime; Litman et al., 2017; Litman & Robinson, 2020). Participants were compensated with $5 paid through Mturk for their participation. Participants were women between 18 and 34 years (M = 29.3, SD = 3.58). Participants were White (60.5%), African American (17.3%), Asian/Pacific Islander (9.9%), Latinx (6.2%), Multiracial (4.9%), or identified as another race (1.2%).

Participants for the in-person study (N = 130) were recruited from the University of Missouri-St. Louis (UMSL) through flyers, emails, classroom recruitment, the Department of Psychological Sciences Sona System (Bethesda, Maryland), social media advertisements (e.g., Facebook, Instagram), and Research Match (Nashville, Tennessee). Mturk by CloudResearch was also used to reach participants outside of the UMSL community. Participants were compensated with $50 or 2 SONA credits for the completion of the experiment. Participants were women between 18 and 34 years (M = 23.4 SD = 4.12). Participants were White (43.3%), African American (25.2%), Asian/Pacific Islander (18.1%), Latinx (7.9%), Multiracial (4.7%), or identified as another race (0.8%).

Measures

State Anxiety

Self-reported state anxiety was assessed in the in-person study using the state anxiety subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, 1983). This 20-

item subscale is rated on a 4-point scale, from 1 (*Not at all*) to 4 (*Very much so*). A sample item includes, “Right now, at this moment, I feel upset.” Items were reverse coded and summed, with higher values indicating greater anxiety. Overall, this scale displayed good internal reliability, Cronbach’s α = .886.

Positive and Negative Affect Schedule (PANAS)

Self-reported negative mood was assessed in the in-person study using the negative affect subscale of PANAS (Watson et al., 1988; α = .87). The subscale contains 10-items rated on a 6-point scale from, 1 (*Not at all)* to 6 (*Extremely*). A sample item includes, “Right now, in this moment, I feel sad.” Items were summed, with higher values indicating greater negative affect. Self-reported positive mood was assessed using the positive affect subscale of PANAS (Watson et al., 1988). The subscale contains 10-items rated on a 6-point scale from, 1 (*Not at all)* to 6 (*Extremely*). A sample item includes, “Right now, in this moment, I feel excited.” Items were summed, with higher values indicating greater negative affect. The scale displayed good internal reliability, Cronbach’s α = .804.. The influence of positive mood is not directly related to the hypotheses, but positive mood was included to reduce demand characteristics. The scale also displayed good internal reliability, Cronbach’s α = .909.

State Approach Motivation

Self-reported state approach motivation was assessed in the in-person study using the drive subscale of the BAS scale (Eftekhari, 2017; α = .76). This 4-item subscale is rated on a 4-point scale, from 1 (*Strongly disagree*) to 4 (*Strongly agree*). A sample item includes, "In this moment, if I saw a chance to get something I want, I would move on it right away.” Items were averaged to assess motivation, with higher values indicating

greater approach motivation. Overall, the scale displayed acceptable internal reliability, Cronbach's $\alpha = .781$.

Electrophysiological Recording

A 16-channel acquisition amplifier and acquisition software (ActiveTwo System, BioSemi, Amsterdam, The Netherlands) were used to acquire EEG recordings during the in-person study. A nylon electrode cap with sixteen Ag/AgCl active electrodes were placed on the participant's scalp to record brain activity, according to the 10–20 International System (O1, Oz, O2, P3, Pz, P4, T7, T8, C3, Cz, C4, F3, Fz, F4, Fp1, Fp2). Two electrodes were placed on the right and left mastoids (M1/ 2) for referencing, and vertical electrooculogram (VEOG) and horizontal electrooculogram (HEOG) were attached above and below the left eye and outside of the right and left eyes to detect ocular artifacts. An active common mode sense electrode (CMS) and a passive driven right leg electrode (DRL) were used to create a feedback loop for amplifier reference. All voltages were digitized with a sample rate of 512 Hz, a 24-bit A/D conversion, and a low-pass filter of 134 Hz. Measures of reactive approach motivation (i.e., alpha hemispheric asymmetries) and self-regulation (i.e., ERN amplitude differences) were measured using EEG methodology.

Stroop Task

A Stroop task was used as a measure of cognitive performance (Hirsh & Inzlicht, 2010) in the online and in-person study, adapted from the procedure described by Stroop (1935). Participants were shown a color word typed in various font colors (e.g., blue). The color of the text matched the word (e.g., the word blue with blue-colored text) in congruent trials and did not match the word (e.g., the word blue with red-colored text) in

incongruent trials. The participants were asked to indicate the color of the text for each stimulus as quickly and as accurately as possible. Participants in the online study responded to each stimulus using their standard keys (i.e., “k,” “h,” “f,” and “s”) on their computer keyboard while the in-person participants responded to each stimulus using an adapted keyboard with large colored buttons corresponding with each text color (i.e., red, blue, yellow, green). Participants completed 200 practice trials and 240 experimental trials and were evaluated on their differences in proportion of correct responses, response latencies, and ERN amplitudes. Within these trials, participants view a jittered fixation cross displayed for 400-600ms, followed by a stimulus that remained on the screen until the participant’s response. Trials that took shorter than 250ms or took longer than 1,500ms were excluded from analyses. No trials were excluded using this criterion for both the online and in-person study. Lastly, participants saw a blank screen for 1,000 ms. Difference in ERN amplitude between incorrect responses and correct responses for incongruent trials was used to analyze ERN amplitude (Riesel et al., 2013). Individuals who have impaired self-regulation were expected to display a smaller difference in ERN amplitudes for incorrect responses compared to correct responses on incongruent trials. Individuals who have impaired cognitive performance were expected to be slower to respond and have low proportions of correct responses in incongruent trial.

Group Member Evaluation

Participants in the online and in-person study evaluated each group member in the manipulation video by answering 7 questions rated on a 6-point scale from 1 (*Not much at all*) to 6 (*A very great deal*). The questions assessed the group members’ contributions to the group, competence, focus, helpfulness, friendliness, likability, and respectfulness

(see Appendix). A sample question includes “How much did [name of group member] contribute to the problem-solving activity?” The influence of the evaluations was not directly related to the hypotheses but was used for manipulation validation and exploratory analyses.

Manipulation Check

Two multiple-choice questions were used to assess the sexism manipulation’s success at creating a sexist experience. The questions inquired if a group member displayed sexist behaviors while working in the group and if any group member confronted the sexist behavior (see Appendix). Depending on one’s response, additional questions probe about which group member(s) displayed the behavior (see Appendix). The correct answers to the manipulation check question differed for each condition. Participants who did not correctly answer the manipulation checks were excluded from analyses. No online participants were excluded; however, seven in-person participants were excluded from analysis due to these criteria. An additional question in the in-person study inquired about what the participant thought about during the hemispheric activity session. Participants (n = 3) were excluded from approach motivation analyses if they thought about the experimental manipulation during RAM section of the experiment, as electrophysiological recordings would not accurately assess RAM towards alternative goals or ideals.

Procedure

Online Study

Participants were first instructed to complete online self-report measures, hosted by Qualtrics (Provo, Utah), to determine eligibility. Once participants completed the

eligibility questionnaire, they were directed to an online informed consent page. Participants were then randomly assigned to watch one of three 5-minute videos. Each video were recordings of a Zoom classroom breakout session, where three white college-aged students (i.e., two men, one woman) are assigned to work together to solve a mathematical word problem. The participant was told that they were assigned the role of reviewer and would be evaluating whether online environments are suitable for mathematical group work and should make note if all students contributed equally. In the video interaction, before going to the breakout room, nine students (i.e., eight white men, one white woman) listened to a white male professor iterate instructions to the group members (see Appendix). This scene was present in the video to highlight the underrepresentation of women among group members, to reiterate the instructions to the participant, and to stress to the participants that the group members knew that the participant would be evaluating them. After the instructions, the scene faded to the Zoom classroom breakout session, where two men and one woman worked together to solve the mathematical problem. In the direct target sexism condition, a man made the sexist comment, "Who knows how we will do as a group, especially if we get a girl evaluator," stated in a joking manner. This comment is sexist because it reflects the underlying belief that women (i.e., the participants) are not as capable at mathematics as men and, therefore, cannot accurately assess the group member's performance. So, the sexist comment was directed to the participant. In the witness sexism condition, a man made the sexist comment, "Who knows how we will do as a group, especially if the other groups are all guys," stated in a joking manner. This comment is sexist because it also reflects the underlying belief that women are not as capable at mathematics as men and,

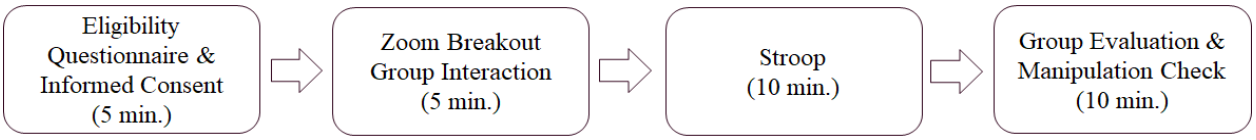
therefore, the group's performance will be negatively affected by having a woman team member. So, the participant witnessed a sexist comment that was not directed specifically to her. In the control condition, the mathematical problem was solved without comments related to gender. The sexist comment was made after the introductory piece of the video, at the beginning of the group break-out session (see Appendix).

After the comment, the problem was solved normally, with no distinct facial reaction from the other group members and with all group members contributing equally to solving the mathematical problem. Prior research suggest individuals may base their perceptions of a sexist remark off the reactions of others involved (Czopp, 2019). Therefore, to increase the ambiguity of the comment, no distinct facial reactions were made by the other group members. Additionally, prior research suggests that witnessing poor (e.g., unequal) performance of a women in a male-dominated field increases the fear of being negatively stereotyped (i.e., stereotype threat) and decreases performance (Elizaga & Markman, 2008). Given that the present experiment aimed to investigate allyship protection against sexist behavior and not stereotype threat on performance and self-regulation, all group members contributed equally to solving the mathematical problem.

After watching one of the three videos, participants were instructed to complete the Stroop task, hosted by Millisecond using Inquisit Web 6.0 software (Inquisit 6 Web, Millisecond Software, Seattle, WA), during which their performance rates and response times were recorded. After completing the cognitive task, the participant was instructed to evaluate each video group member and respond to manipulation checks. The entire procedure took 30 minutes.

Figure 2

Timeline of Online Procedure



In-Person Study

Before arrival to the lab, participants were instructed to complete online self-report measures, hosted by Qualtrics (Provo, Utah), to determine eligibility. Once participants completed the eligibility questionnaire, they were directed to a Doodle poll to schedule an appointment to participate in the lab portion of the study.

When participants arrived at the lab, they completed an informed consent form. Once informed consent had been obtained, an EEG cap and sensors were connected to the participant to record eye movements and blinks, and electrophysiological activity. After informed consent and equipment attachment, participants were instructed to sit quietly for five minutes, during which baseline alpha hemispheric activity was recorded. The baseline alpha hemispheric activity recording was used as a covariate when analyzing reactive approach motivation (McGregor et al., 2009).

Manipulation. After baseline, participants were randomly assigned to watch one of two 5-minute videos (i.e., allyship, without allyship), which replicate the online study's video procedure. In the witness condition without ally support, a man made the sexist comment, "Who knows how we will do as a group, especially if the other groups are all guys," stated in a joking manner. This comment is sexist because it reflects the underlying belief that women are not as capable at mathematics as men and, therefore, the group's performance will be negatively affected by having a woman team member.

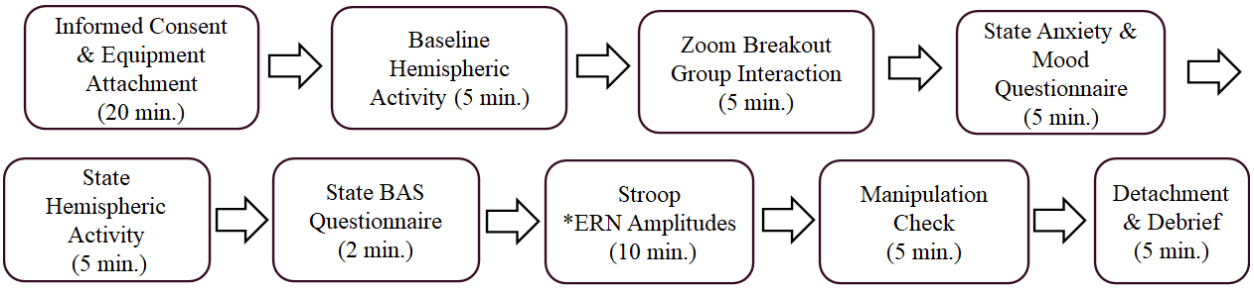
The other man said nothing. In the witness condition with ally support, a man made the same remark, but the other man refuted the comment by saying, "I think we will do just as good as the other groups. Why does it matter if everyone else has all guys in their group?" This comment shows allyship because it contradicts the belief that women are not as capable at mathematics as men and, therefore, refutes the idea that the group's performance will be negatively affected by having a woman team member. The man who made the sexist comment did not respond to the objection (see Appendix). Additional confrontation may add to the participant's anxiety and negative mood. This increased reactivity caused by the confrontation might have masked the reactivity caused by the sexist comment and limited our ability to determine the protective benefits of ally support.

Post-Manipulation. After the participants view their assigned video, participants were directed to an online survey, hosted by Qualtrics (Provo, Utah), where self-reported state anxiety and negative mood were assessed. After, participants were told to sit quietly and relax for 5 minutes. During this time the participants' alpha hemispheric activity was recorded to measure shifts in RAM from baseline (McGregor et al., 2009). After that, participants were directed to an online survey, hosted by Qualtrics (Provo, Utah), where self-reported RAM was assessed (i.e., self-reported BAS). Afterward, the participants were directed to complete the Stroop task, hosted by Millisecond using Inquisit Web 6.0 software (Inquisit 6 Lab, Millisecond Software, Seattle, WA, USA), during which their task performance and electrophysiological activity (i.e., ERN amplitude differences) were recorded. After completing the cognitive task, the participant was instructed to evaluate each group member they observed in the video and respond to manipulation checks.

After, the researcher debriefed the participant and granted compensation. The entire procedure took 62 minutes.

Figure 3

Timeline of In-Person Procedure



Data Preparation

Cortical Asymmetries

Alpha hemispheric activity was only recorded during the in-person study to investigate the electrophysiological effects of witnessing sexism. BrainVision Analyzer 2 (Brain Vision LLC; Morrisville, NC) was used for preprocessing and analysis. All scalp electrodes were re-referenced to an averaged mastoid reference. Data were filtered using a .1-100 Hz band-pass filter and a 60 Hz notch filter (Nash et al., 2010). Data segments collected during baseline and the hemispheric activity session were divided into 2s epochs to correct for ocular artifacts using a semi-automatically process according to Gratton, Coles, and Donchin (1983). Segments were rejected based on a maximum allowed voltage gradient of 75 μV and a maximum absolute difference threshold of 75 μV (Nash er al., 2010). For each accepted epoch, a Hamming windowing was applied and overlapped by 50% to minimize loss of data. After artifact rejection, a Fast Fourier Transformation was applied to each remaining segment to determine the power alpha frequency band (8-13 HZ), which was then averaged over all segments. The quantities at all sites were log transformed to reduce positive skew (Nash et al., 2010). Alpha hemispheric asymmetry was computed by subtracting left alpha power from right alpha power (F4-F3). Alpha power is inversely related to activity (Nash et al., 2010), thus positive values represent greater left frontal cortical activation and negative values represent greater right frontal cortical activation (Nash et al., 2010).

Error Related Negativity (ERN)

ERN amplitudes were only recorded during the in-person study to investigate the electrophysiological effects of witnessing sexism BrainVision Analyzer 2 (Brain Vision

LLC; Morrisville, NC) was used for preprocessing and analysis. All scalp electrodes were re-referenced to an averaged mastoid reference. Data were filtered using a .5-30 Hz band-pass filter and a 60 Hz notch filter. The data were segmented in epochs from 200 ms before the onset of participant response until 1000 ms post-response onset. Occular artifact corrections were applied semi-automatically according to Gratton, Coles, and Donchin (1983). The mean 200 ms pre-response period was used for baseline corrections and artifact rejection was performed at individual electrodes based on a maximum allowed voltage gradient of 50 μV and a maximum absolute difference threshold of 70 μV (Inzlicht & Gutsell, 2007). To assess error detection and self-control during the Stroop, EEG signals were response-locked and segmented into individual trials per participant. The ERN was averaged based on trial type (incongruent or congruent) and response (correct or incorrect) within each participant. Peaks of the averaged waveforms were then labeled at the frontal (Fz) scalp locations for amplitudes within 50-80ms after response (Dehaene et al., 1994). Amplitude difference between incorrect and correct responses on incongruent trials were analyzed. Greater differences between incorrect and correct response negative amplitudes of the ERN on incongruent trials were interpreted as higher self-regulation and lower amplitude differences of the ERN between incorrect and correct responses on incongruent trials, particularly for incorrect responses, were interpreted as lower self-regulation.

Statistical Analyses

Online Study

The online study aimed to demonstrate that witnessing sexism is as cognitively impactful as directly experiencing sexism. Sexism exposure was analyzed as the independent variable, while proportion of correct responses and response latencies were each separately analyzed as continuous dependent variables. All analyses were conducted using SPSS 28 (IBM, 2022). The significance level for all analyses was 5% ($\alpha = .05$). Three low performance and four high response time outliers were found. A 90% Winsorization was performed on each variable (i.e., performance rates, response latencies). The assumption of independence was met for the performance rate and response latencies variables. The assumption of normality was violated for both variables and the homogeneity of variance assumption was violated for the performance rates variables. ANOVA is fairly robust to violations of normality and a Welsh's ANOVA was run for performance rate analyses to compensate for the violations of homogeneity. A Fisher's ANVOA was run for responses latencies analyses.

In-Person Study

The in-person study aimed to examine the cognitive and electrophysiological effects of witnessing sexism, with or without an ally, and investigate the mediating relationship of psychological reactivity (i.e., state anxiety, negative mood) and RAM (i.e., alpha hemispheric asymmetries, BAS). All hypotheses testing analyses were conducted using SPSS 28 (IBM, 2022). The significance level for all analyses was 5% ($\alpha = .05$). In addition to the participants removed due to the manipulation checks, data was screened for outliers using Mahalanobis' Distance, Cook's D, and leverage*;* no outliers were found

when using these criteria. Assumptions of linearity and multicollinearity were met, while there were slight violations to homoscedasticity and normality assumptions in each analysis. All the serial mediation hypotheses (H2a-H6c) were tested using the PROCESS macro v4.0 for SPSS 28 (model 6; Hayes, 2017). Allyship condition was entered as the dichotomous predictor variable, while ERN amplitude differences, proportions of correct responses, and response latencies on a Stroop task were each separately entered as continuous dependent variables. Psychological reactivity, as measured by self-report state anxiety and negative mood, were each be separately entered as a (first) continuous serial mediator of the relationship between allyship condition and cognitive functioning. Approach motivation, as measured by alpha hemispheric asymmetries and self-reported BAS, were each be separately entered as a (second) continuous serial mediator of the relationship between allyship condition and cognitive functioning. Baseline alpha hemispheric asymmetry was entered as a covariate for analyses involving state approach motivation measured by EEG.

Results

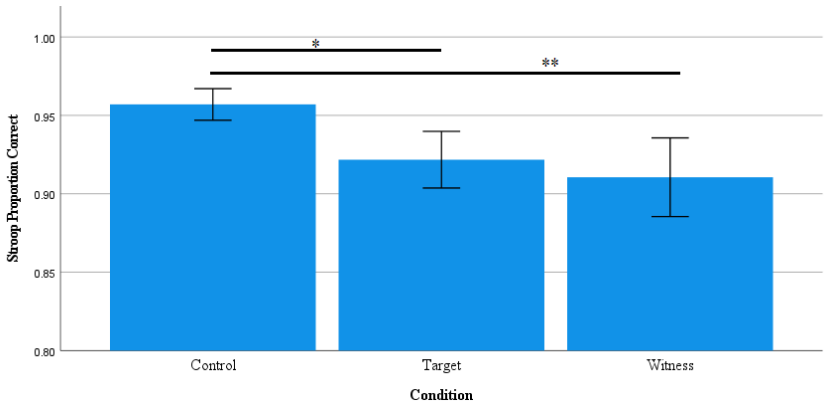
Online Study

Stroop Task

The mean proportion of correct responses on the Stroop task was .925 (*SD* = .075) and the mean response time on the Stroop task was 855 ms (*SD* = 424). To test hypotheses H1a-c, ANOVA analyses were computed to examine the differences between sexism exposure (i.e., target, witness, control) on cognitive functioning (i.e., proportions of correct responses, response latencies) on the Stroop task. It was hypothesized that women who are targets, or witnesses of sexism will show a lower proportion of correct responses on a Stroop task compared to women in the control condition (H1a), but that there would be no significant differences in cognitive impairment between women in the direct sexism or witness conditions (H1c). In support of H1a and H1c, there was a significant effect of sexism exposure (i.e., target, witness, control) on proportion of correct responses on the Stroop task, F (2, 44.9) = 9.75, $p < .001$. Post hoc comparisons (i.e., Tukey) indicated that women who witnessed the sexist remark performed significantly worse (M = 0.911, SD = .064) than women in the control condition (M = .957, SD = .027; p = .002) but did not differ in performance (i.e., proportion of correct responses) compared to women who were direct targets (M = .922, SD = .047; p = .673). Additionally, women who were targets of the sexist remark had significantly lower proportions of correct responses than women in the control condition (p = .021; see Figure 6). These results suggest that witnessing sexism is just as cognitively impactful as being a direct target.

Figure 6

Stroop Performance Differences by Sexism Condition

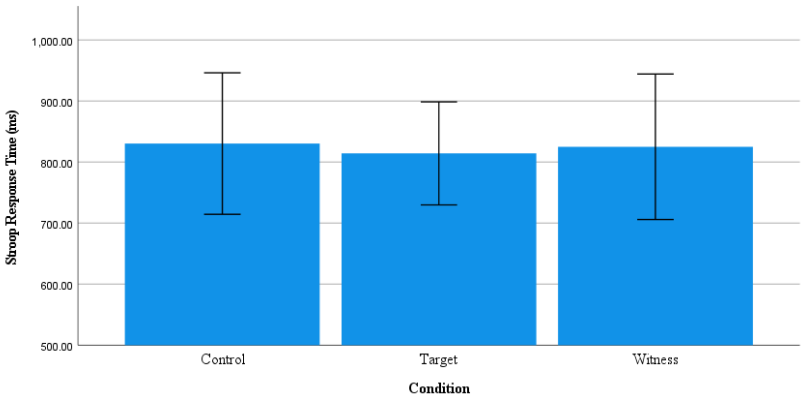


Note. This figure shows the mean of Stroop performance by sexism condition before outliers were removed. Stroop performance was measured by proportion of correct responses, with higher scores indicating better performance. *$p < .05$, **$p < .01$, ***$p < .001$.

It was also hypothesized that women who are targets, or witnesses of sexism will show a longer response times on the Stroop task compared to women in the control condition (H1b), but that there would be no significant differences in cognitive impairment between women in the direct sexism or witness conditions (H1c) Contradicting H1b and in support of H1c, there was not a significant effect of sexism exposure (i.e., control, target, witness) on response time for correct trials on the Stroop task, F (2,78) = 0.564, p = .571 (see Figure 7). These results partially support that witnessing sexism has similar cognitive consequences (i.e., impaired performance) to being a direct target of sexism.

Figure 7

Stroop Response Times by Sexism Condition



Note. This figure shows Stroop response times by sexism condition before outliers were removed. Stroop response times were measured in milliseconds, with higher scores indicating longer response times. *$p < .05$, **$p < .01$, ***$p < .001$.

Before outlier corrections, there was still a significant difference in proportions of correct responses on the Stroop task, F (2, 42.9) = 8.91, $p < .001$; however, post hoc analyses show that only women in the witness condition ($p = .003$), and not direct targets ($p = .292$), were significantly different from the control group. Results of Stroop response times did not change.

Group Member Evaluations

ANOVA analyses were computed to examine the differences between sexism exposure (i.e., target, witness, control) on group member evaluations. The assumption of independence, normality, and homogeneity of variance were met for all group evaluation comparisons. As shown in Table 1, women in the control condition rated the sexist man as being more focused, helpful, friendly, likable, respectful, competent, and having made more contributions to the group compared to women in the target and witness condition, all *p's < .05*. Women in the target and witness conditions did not differ in any evaluations of the sexist man, all p's > .05. As shown in Table 2 and 3, sexism exposure groups did not differ in any of the evaluations of the women who was the target of

sexism, all *p*'s > .05, nor did they differ in any of the evaluations of the man who witnessed the sexist remark, all *p*'s > .05. These results show that participants who witnessed the sexist remark evaluated the sexist man as negative as the participants who were the direct targets of sexism.

In-Person Study

Questionnaires

The mean of the STAI was 1.741 (*SD* = .439), the mean of negative subscale of PANAS was 12.390 (*SD*= 3.321), and the mean of the drive subscale of BAS was 2.831 (*SD* = .606). As expected, STAI was positively correlated with PANAS, $r(128) = .689$, $p < .001$. Unexpectedly, allyship did not correlated with either STAI or PANAS, both *p's* > .05.

Alpha Hemispheric Asymmetries

The mean of participant's alpha hemispheric asymmetries before viewing the sexist video was .119 (*SD* = .333), while the mean of participant's alpha hemispheric asymmetries after viewing the sexist video was .125 (*SD* = .325). Alpha hemispheric asymmetries before the sexist video were positively correlated with alpha hemispheric asymmetries after the sexist video, $r(128) = .975$, $p < .001$. However, while previous research has used self-reported BAS (Eftekhari et al., 2017; McGregor et al., 2010) and alpha hemispheric asymmetries (McGregor et al., 2009) as measures of RAM, the current study did not find a significant relationship between these two variables, $r(118) = .027$, $p = .772$. Allyship also did not correlate with either variable, both *p*'s > .05.

Stroop Task and ERN

The mean proportion of correct responses on the Stroop task was .960 (*SD* = .051) and the mean response time on the Stroop task was 874 ms (*SD* = 442). To compare the mean proportion correct responses on the Stroop task between the four sexism conditions across both the online (target and witness) and the in-person study (allyship and no allyship), a one-way ANOVA with four groups was conducted. There was a significant main effect of group, $F(3, 164) = 9.068$, $p < .001$. Post hoc comparisons (i.e., Tukey) indicated that women who were exposed to sexism in the online study, as a direct target (*M* = .922, *SD* = .046) or a witness (*M* = .911, *SD* = .064), performed significantly worse than participants who were exposed to sexism in the in-person study, with an ally (*M* = .958, *SD* = .079) or without an ally (*M* = .969, *SD* = .050), *p*'s < .05. However, no differences were found between the target and witness conditions of the online study ($p = .420$). Additionally, no differences were found between allyship and no allyship conditions of the in-person study ($p = .823$). Therefore, participant exposed to sexism in the in-person study, with or without ally support, unexpectedly performed better on the Stroop task than participants in the online study who were also exposed to sexism (i.e., target, witness).

The mean of the difference in ERN amplitudes between correct and incorrect trials on incongruent trials was -1.187 (*SD* = 4.081). Besides Stroop performance (i.e., proportion of correct trials) being negatively correlated with Stroop response time $r(128) = -.350$, $p < .001$, no other study variables correlated with Stroop performance or Stroop response times, all *p*'s > .05. Additionally, none of the study's variables correlated with ERN amplitude differences, all *p*'s > .05.

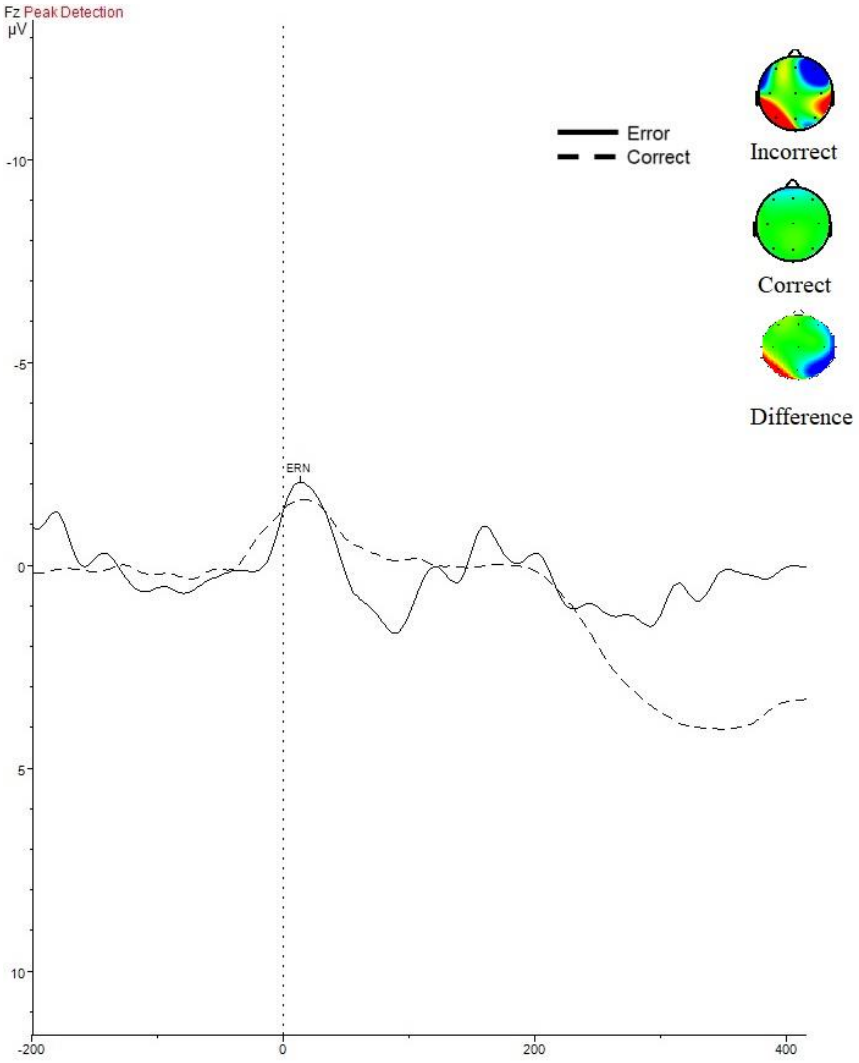
The data did show evidence of the Stroop effect, with longer responses times for incongruent trials (M = 1001, SD = 687) compared to congruent trials (M = 790, SD = 402), $t(122) = 4.755$, $p < .001$, and with participants performing better (i.e., proportion of correct responses) on congruent trials (M = .976, SD = .002) compared to incongruent trials (M = .952, SD = .010), $t(122) = -2.28$, $p = .024$. The Stroop interference on reaction time was calculated by subtracting congruent trials' reaction time from incongruent trials' reaction time. Stroop interference on the proportion of correct responses was calculated by subtracting the proportion of correct responses to incongruent trails from the proportion of correct responses to congruent trails. While Stroop interference of reaction time and proportion of correct responses correlated with each other $r(128) = .888$, $p < .001$; no other study variables correlated with either Stroop interference effect, all p's > .05.

Prior research suggests that five incorrect trials are needed to average ERN activity for sufficient reliability (Cronbach's $\alpha = .70$; Boudewyn et al., 2017; Olvet & Hajcak, 2009). Most participants had high performance on the Stroop tasks (M = .964, SD = .062); as a result, a limited number of participants (n = 35) had enough incorrect responses (i.e., congruent or incongruent) after data cleaning to be included in analyses. While previous research has demonstrated that the ERN activity is most prominent among incorrect responses compared to correct responses on incongruent trials at the frontal-central region of the scalp (Hewig et al., 2011), brain mapping shows positive activity over the temporal and occipital scalp during incorrect responses on incongruent trials, nor were their differences between incorrect (M = -3.576, SD = 3.997) and correct responses for incongruent trials (M = -2.399, SD = 1.97), $t(34) = -1.720$, $p = .095$ (see

Figure 4). So, it seems like no ERN was elicited in the Stroop task. Correspondingly, results show no significant difference in ERN amplitudes for incorrect incongruent trials between allyship conditions, $t(33) = .952$, $p = .348$ (see Figure 5).

Figure 4

ERN amplitudes of correct and incorrect responses on incongruent trials.

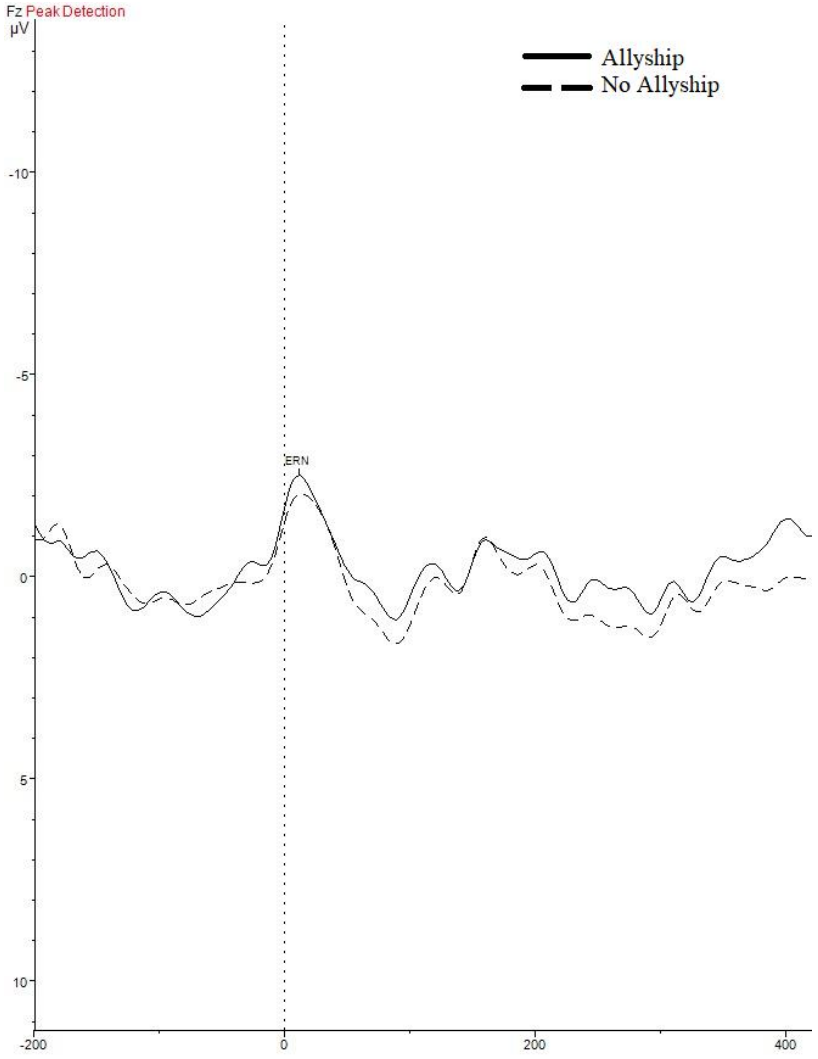


Note. Averaged response-locked ERP at Fz electrode displaying amplitude differences between correct and error incongruent trials. The ERN is the negative amplitude peaking

at approximately 50ms to 80 ms. Brain mapping activity for incorrect and correct responses of incongruent trials is presented on a scale of -5 μv to 5 μv.

Figure 5

ERN amplitudes of incorrect incongruent trials between allyship and no allyship conditions.



Note. Averaged response-locked ERP at Fz electrode displaying amplitude differences of incorrect incongruent trials between allyship and no allyship condition. The ERN is the negative amplitude peaking at approximately 50 ms to 80 ms.

Mediation Analyses

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate lower performance rates (i.e., proportion of correct trials) on the Stroop task compared to women with ally support (H2a). In contradiction of H2a (see Table 4 and 5), allyship did not predict Stroop performance (path c'), b = -.010, $t(119)$ = -.923, p = .358. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5a) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict Stroop performance, in contradiction of H4a, H5a, and H6a, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate lower performance rates (i.e., proportion of correct trials) on the Stroop task compared to women with ally support (H2a). In contradiction of H2a (see Table 6 and 7), allyship did not predict Stroop performance (path c'), b = -.007, $t(119)$ = -.011, p = .535. It was also hypothesized that negative mood (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5a) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict Stroop performance, in contradiction of H4a, H5a, and H6a, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate lower performance rates (i.e., proportion of correct trials) on the Stroop task compared to women with ally support (H2a). In contradiction of H2a (see Table 8 and 9), allyship did not predict Stroop performance (path c'), b = -.011, $t(115)$ = -.994, p = .323. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4a) and alpha hemispheric asymmetries (i.e., RAM; H5a) would both individually and

serially (H6a) mediate this relationship. Given that allyship did not predict Stroop performance, in contradiction of H4a, H5a, and H6a, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate lower performance rates (i.e., proportion of correct trials) on the Stroop task compared to women with ally support (H2a). In contradiction of H2a (see Table 10 and 11), allyship did not predict Stroop performance (path c'), b = -.011, $t(112)$ = -.908, p = .366. It was also hypothesized that negative mood (i.e., psychological reactivity; H4a) and alpha hemispheric activity (i.e., RAM; H5a) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict Stroop performance, in contradiction of H4a, H5a, and H6a, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate slower responses times on the Stroop task compared to women with ally support (H2b). In contradiction of H2b (see Table 12 and 13), allyship did not predict Stroop response times (path c'), b = 6.728, $t(119)$ = -.085, p = .932. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5a) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict Stroop response times, in contradiction of H4b, H5b, and H6b, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate slower responses times on the Stroop task compared to women with ally support (H2b). In contradiction of H2b (see Table 14 and 15), allyship

did not predict Stroop response times (path c'), b = -13.438, $t(119)$ = -.165, p = .870. It was also hypothesized that negative mood (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5a) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict Stroop response times, in contradiction of H4b, H5b, and H6b, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate slower responses times on the Stroop task compared to women with ally support (H2b). In contradiction of H2b (see Table 16 and 17), allyship did not predict Stroop response times (path c'), b = -.295, $t(119)$ = -.004, p = .997. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4b) and alpha hemispheric activity (i.e., RAM; H5a) would both individually and serially (H6b) mediate this relationship. Given that allyship did not predict Stroop response times, in contradiction of H4b, H5b, and H6b, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate slower responses times on the Stroop task compared to women with ally support (H2b). In contradiction of H2b (see Table 18 and 19), allyship did not predict Stroop response times (path c'), b = -20.055, $t(112)$ = -.233, p = .816. It was also hypothesized that negative mood (i.e., psychological reactivity; H4b) and alpha hemispheric activity (i.e., RAM; H5a) would both individually and serially (H6b) mediate this relationship. Given that allyship did not predict Stroop response times, in contradiction of H4b, H5b, and H6b, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate smaller ERN amplitude differences between incorrect and

correct responses on incongruent trials compared to women with ally support (H3). In contradiction of H3 (see Table 20 and 21), allyship did not predict ERN amplitude differences (path c'), b = -.476, $t(30)$ = -.309, p = .759. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4a) and alpha hemispheric activity (i.e., RAM; H5c) would both individually and serially (H6a) mediate this relationship. Given that allyship did not predict ERN amplitude differences, in contradiction of H4c, H5c, H6c, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate smaller ERN amplitude differences between incorrect and correct responses on incongruent trials compared to women with ally support (H3). In contradiction of H3 (see Table 22 and 23), allyship did not predict ERN amplitude differences (path c'), b = -.827, $t(31)$ = -.551, p = .585. It was also hypothesized that state anxiety (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5c) would both individually and serially (H6c) mediate this relationship. Given that allyship did not predict ERN amplitude differences, in contradiction of H4c, H5c, H6c, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate smaller ERN amplitude differences between incorrect and correct responses on incongruent trials compared to women with ally support (H3). In contradiction of H3 (see Table 24 and 25), allyship did not predict ERN amplitude differences (path c'), b = -1.415, $t(31)$ = -.849, p = .403. It was also hypothesized that negative mood (i.e., psychological reactivity; H4a) and self-reported BAS (i.e., RAM; H5c) would both individually and serially (Hc) mediate this relationship. Given that

allyship did not predict ERN amplitude differences, in contradiction of H4c, H5c, H6c, there does not exist a relationship to be mediated.

It was hypothesized that women who witness a sexist interaction without ally support would demonstrate smaller ERN amplitude differences between incorrect and correct responses on incongruent trials compared to women with ally support (H3). In contradiction of H3 (see Table 26 and 27), allyship did not predict ERN amplitude differences (path c'), b = -1.034, $t(30)$ = -.616, p = .543. It was also hypothesized that negative mood (i.e., psychological reactivity; H4a) and alpha hemispheric activity (i.e., RAM; H5c) would both individually and serially (H6c) mediate this relationship. Given that allyship did not predict ERN amplitude differences, in contradiction of H4c, H5c, H6c, there does not exist a relationship to be mediated.

Group Member Evaluations

Independent samples t-tests were conducted to examine the differences in group member evaluations between allyship conditions (i.e., with ally support, without ally support). The assumptions of independence, normality, and homogeneity of variance were met for all group evaluation comparisons. As shown in Table 28, women who experienced ally support did not evaluate the sexist man any different in terms of contribution, focus, helpfulness, friendliness, likability, respect, and competence than women who did not have ally support, all p's > .05. As shown in Table 29, women in the ally condition (M = 4.44, SD = 1.02) viewed the women who was the target of the sexist remark as more likeable compared to women in the without ally condition (M = 3.77, SD = 1.29), $t(122)$ = -3.151, p = .002; however, the conditions (i.e., with ally support, without ally support) did not differ on any other evaluation of the women target, all p's >

.*05*. Lastly, as shown in Table 30, women in the ally condition viewed the man who spoke out against the sexist treatment as more helpful, friendly, more likable, more respectful, than women in the no ally condition, all *p*'s > .05; however, evaluations of contribution, focus, and competence did not differ between groups, all *p*'s > .05. These results suggest that allyship may not affect group member evaluations of the sexist man or woman target but may positively affect evaluations of the man who spoke out against sexism (i.e., the ally), ultimately improving intergroup dynamics.

Discussion

The current studies examined whether witnessing sexism, with or without an ally, impairs cognitive performance and self-regulation and whether negative psychological reactivity and motivation serially mediate this relationship. It was proposed that allyship would decrease psychological reactivity (i.e., anxiety, negative mood), ultimately deterring motivational shifts to approach motivation (i.e., self-reported BAS, alpha hemispheric activity), which directs attention away from goal-oriented behaviors, inhibiting performance on cognitive tasks.

Results of the online study partially support witnessing sexism has similar cognitive consequences to being a direct target of sexism. Women who were exposed to a sexist remark, either as a target or a witness, performed worse on a cognitive task (i.e., Stroop) compared to women who were not exposed to sexism. However, groups did not differ in Stroop response times. Additionally, exploratory analyses showed that being exposed to sexism (i.e., witness or target) negatively impacted group evaluations of the sexist man. Women who were exposed to sexism rated the sexist man as less warm (i.e., lower friendliness, respectfulness, and likeable evaluations) and less competent (i.e., lower focused, helpfulness, competence, and contribution evaluations) compared to women who were not exposed to sexism.

According to the s*tereotype content model,* warmth and competence impressions are enacted in interactions even during the first few moments of contact (Fisk et al., 2006). High warmth evaluations represent trustworthiness, empathy, and low threat; while high competence evaluations represent intelligence, power, and skill (Fisk et al., 2018). Prior research demonstrates that warmth and competence assessments impact how

individuals interact with one another. For example, warmth appraisals influence how much we trust an individual's motives (Fisk et al., 2018). These findings may suggest that being exposed to sexism can impact women's performance and cognitive functioning and may ultimately result in poor intergroup dynamics. Additionally, these findings demonstrate that witnessing sexism in impersonal (i.e., stranger interactions), virtual environments can negatively affect women's well-being in similar ways to being a direct target of sexism. These findings are consistent with prior research that demonstrates that being a target of sexism negatively impacts individuals psychological (Swim et al., 2001), physiological (Casad & Petzel, 2018; Lamarche et al., 2020), and cognitive (Salomon et al., 2015; Schmader & Johns, 2003; Schmader et al., 2008) states. It also is consistent with the limited research that demonstrates that being a witness of a sexism can also impact one's psychological well-being (Bradley-Geist et al., 2015; LaCosse et al., 2016).

Results of the in-person study indicated that after witnessing a sexist remark, the absence or presence of an ally did not influence cognitive functioning or self-regulation. As a result, psychological reactivity (i.e., state anxiety and negative mood) and approach motivation (i.e., self-reported BAS, alpha hemispherical activity), did not serially (or individually) mediate the relationship between allyship and cognitive functioning and self-regulation. Due to the lack of a relationship between allyship and cognitive functioning and self-regulation, the current study could not fully assess the merit of the RAM perspective to explain why women face negative consequences after witnessing sexism.

Exploratory analyses indicated that group evaluations of sexist man did not differ between allyship conditions (i.e., with and without ally support). However, allyship conditions did differ in their perceptions of the woman who was the target of sexism and the man who witnessed and stood up against the sexist remark, with women who had ally support having more positive perceptions. These finding *may* suggest that having an ally does not buffer the negative effects of sexism that the witness experiences but may positively impact intergroup dynamics. However, these findings are inconsistent with prior research that suggests that having an ally may buffer the negative effects of being a target of prejudice or discrimination (Louis et al., 2019), since they may feel more comfortable speaking out and have a stronger belief that they will be taken seriously when they observe individuals speaking out about against the unfair treatment (Drury & Kaiser, 2014; Maranto & Griffin, 2011).

Results also show that allyship did not predict psychological reactivity or approach motivation and that psychological reactivity (i.e., state anxiety and negative mood) and approach motivation (i.e., self-reported BAS, alpha hemispheric activity) also did not predict cognitive functioning and self-regulation. These findings *may* suggest that the RAM perspective does not explain the cognitive function and self-regulation impairments displayed after sexism. However, these findings are also inconsistent with prior research that suggests that in environments where uncertainty is high, individual's anxiety and negative affect increase (McNaughton & Gray, 2000). To alleviate and protect against heightened anxiety and negative affect, motivation shifts occur, directing behavior away from goals related to the environment to abstract alternative goals or cherished ideals (Harmon-Jones & Gable, 2008). Theses shifts are thought to direct one's

attention away from the original tasks in the threatening environment (Leota, 2020; McGregor et al., 2010) and lead to longer-term consequences, such as decreased responses to adverse stimuli (Nash et al., 2012), decreased sensitivity to negative outcomes (Gianotti et al., 2009), and being less self-regulated (Leota, 2020). These inconsistencies may be a result of the methodology of the current study.

Real World Implications

With the underrepresentation of women in STEM still being a pervasive problem, finding interventions to combat sexism could alleviate some of the negative consequences women face. The results of this study may inform interventions to reduce the frequency of sexist behaviors and increase allyship, ultimately protecting against the negative consequences of being exposed to sexism. The study results show that being a direct target or a witness of sexism increases cognitive impairment (i.e., low proportions of correct responses on Stroop). Exploratory results also show that perceptions of the sexist male were negatively affected. Women who were exposed to sexism (i.e., witness and target of sexism) not only rated the sexist male worse on warmth evaluations (i.e., likability, respectfulness, friendliness) but also rated him lower on competence evaluations (i.e., focused, helpfulness, competence, contribution). These results demonstrate that sexist behaviors not only debilitate women exposed to discriminatory treatment but also may negatively impact the perpetrator of the sexism. These results also did not change with ally support, demonstrating that one's perception of the sexist perpetrator solely depends on the perpetrator's behavior. Career success relies heavily on assessing competence and warmth for group member collaboration and advancement (Fisk et al., 2018). Therefore, these results suggest that the perpetrators of sexism should

rethink their behaviors and sexist attitudes as it may affect their personal career trajectories.

Results assessing how allyship affects cognitive functioning and self-regulation after witnessing sexism were inconclusive; however, exploratory results suggest that allyship may positively impact perceptions of the women target and male ally. For example, participants rated women targets who had ally support as more likable compared to women targets who did not have ally support. Additionally, participants rated the male group member as being more helpful, friendly, likable, and respectful when he spoke out against the sexist remark compared to when he was silent. One deterrent of allyship is that potential allies fear negative evaluations and repercussions for supporting the woman target and confronting the sexist (Drury & Kaiser, 2014). However, the current research findings may contradict these fears and help promote advocacy behaviors by demonstrating that allyship not only improves the perception of the women target but also improves the image of the men who speak out against sexism, as they are rated more positively than those who do not respond. Contrarily to the perpetrator of sexist behaviors negatively impacting their career trajectories, speaking out against sexist behaviors may positively impact group member interactions and career success. Overall, these results suggest that allyship improves intergroup dynamics and relationships even in virtual environments involving strangers, which may be less impactful than having face-to-face interactions with friends or acquaintances.

Limitations

Although results may provide novel contributions to the literature on witnessing sexism, motivation, and allyship there are additionally limitations in the design. While

the study includes an online study which compare witnessing sexism to being the direct target of sexism, the in-person study lacks a condition that is not exposed to a sexist comment, nor is there a target group that is directly exposed to a sexist comment. Thus, the current design cannot ensure that cognitive and self-regulation impairments are greater from witnessing a sexist interaction, but rather examines effects of an ally's support. Without a group who was not exposed to sexism, the in-person study cannot determine if the insignificant results of the study were because allyship is not effective at buffering the negative effects of sexism, or if some other methodological phenomena are responsible for the results. Furthermore, the experiment cannot compare the consequences of allyship between being a witness compared to being a target of sexism.

Unforeseen methodological issues may have also contributed to inconclusive results. Participants exposed to sexism in the in-person study performed better on the Stroop task (i.e., a higher proportion of correct responses) than those exposed to sexism in the online study (i.e., target, witness). While not directly hypothesized, it was expected that participants exposed to sexist remarks in the in-person study, especially those without ally support, would have correspondingly poor performance as those exposed to sexism in the online study. These contradictory results may be due to the timing of the in-person study. The in-person measured psychological reactivity and reactive approach motivation, which needed to be included before the Stroop task because they were hypothesized mediators. As a result of these added measures, around 10-15 minutes passed between the sexist remark and the experimental trials of the Stroop task measuring cognitive functioning and self-regulation. In contrast, the online study measured cognitive functioning directly after the sexist video. The participant's intensity of their

response to the sexist remark may have diminished in the added time, resulting in higher performance on the Stroop task; however, group member evaluations measured after the Stroop task were still affected.

Another potential reason for the difference in Stroop performance between the online and in-lab participants may be how the participants responded to each stimulus. Participants in the online study responded to each stimulus using their standard computer keyboards. In contrast, the in-person participants responded to each stimulus using an adapted keyboard with large colored buttons corresponding with each text color (i.e., red, blue, yellow, green). Pressing four large colored buttons on a keyboard may be significantly easier than finding specific keys (i.e., "k," "h," "f," and "s") on a standard keyboard, thus improving performance.

Additionally, as stated previously, due to ceiling effects of the Stroop task, relatively few participants could be included in the ERN analyses (n = 35), which is well below the recommended size (N = 130) if we expected a medium effect size. This smaller sample size decreased the study's power, and therefore, limits hypothesis testing. Furthermore, the current study did not observe a clear ERN as brain activity for incorrect responses of incongruent trials on the Stroop task was not pronounced at the frontal-central electrodes as expected. Therefore, ERN activity was not a reliable measure of self-regulation. Based on these methodological limitations, allyships' impact on cognitive functioning and self-regulation remains unclear.

Previous research has used self-reported BAS (Eftekhari et al., 2017; McGregor et al., 2010) and alpha hemispheric asymmetry (McGregor et al., 2009) as measures of RAM, the current study did not find a significant relationship between these two

variables. This may be due to differences in how each variable was measured. Self-reported BAS was calculated by using a four item sub-scale on rated from 1 (*Strongly disagree*) to 4 (*Strongly agree*). The questions were general, asking questions like “In this moment, if I saw a chance to get something I want, I would move on it right away.” This measurement dramatically differs from the studies measure of alpha hemispheric asymmetry, which was collected during 5 minutes of the study where the participants stat quietly and could think about goals and ideals which were more specific and personal to the individual. Furthermore, participants (n = 3) were excluded from alpha hemispheric asymmetry analyses if they thought about the experimental manipulation during the RAM section of the experiment, as electrophysiological recordings would not accurately assess RAM towards alternative goals or ideals. While this removal was necessary to assess the RAM perspective clearly, participants who ruminated on the sexist interaction may have ultimately had more investment in combating sexist behaviors and, therefore, may have been the participants who were more affected by the sexist remark, exhibiting more psychological reactivity and RAM, ultimately leading to more cognitive and self-regulation impairment. Given that, on average, participants reported low anxiety and negative mood levels after exposure to sexism, with or without allyship, exploratory analyses to investigate how removing these participants impacted study results may be warranted. Based on the limited relationship between the measures of RAM and the study’s methodological limitations, whether RAM impacts cognitive functioning and self-regulation is unclear. Due to the limitations in the present study, the study results are inconclusive. However, future research can consider the methodology and make improvements to better inform effective allyship interventions.

Future Research

Further research should be conducted on whether allyship buffer the negative effects sexism (i.e., target and witness) has on psychological, physiological, and cognitive well-being. This study aimed to add to the current body of literature demonstrating that women who witness sexism experience similar impairments as women who are targets of sexism and increases our knowledge of how allyship may directly impacts women observers (Bradley-Geist et al., 2015; LaCosse et al., 2016). Accounting for the current study's findings and limitations, future research should investigate the impacts allies have on witnesses and targets of sexism by including a condition where women are not exposed to a sexist remark. To our knowledge, research mainly has focused on the ally and their ability to enact behavioral change among the perpetrators of sexism (e.g., other men). Current results still extend prior research and *may* suggest that allyship does not buffer negative affective, motivational, and cognitive consequences of sexism.

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Appendix

Eligibility Questions

1.) What is your gender?
   a. Man
   b. Woman
   c. Transgender
   d. Gender non-binary
   e. Prefer not to Answer

2.) What is your age? [Free Response]

3.) Are you left or right-handed?

   a. Left-Handed

   b. Right-Handed

   c. Prefer not to Answer

4.) Are you currently diagnosed with depression?

a. Yes
b. No
c. Prefer not to answer

5.) Are you currently diagnosed with an anxiety disorder?

a. Yes
b. No
c. Prefer not to answer

6.) Are you currently taking any psychotropic medications, such as medications prescribed for depression, anxiety, bipolar, attention deficit disorder, insomnia, or schizophrenia?

a. Yes
b. No
c. Prefer not to Answer

7.) Do you have any neurological disorders, such as epilepsy, or have you experienced any past brain injury?

a. Yes

b. No

c. Prefer not to Answer

8.) Have you every been diagnosed with color blindness?

a) Yes

b) No

c) Prefer not to Answer

9.) Do you have normal or corrected vision?

a) Yes

b) No

c) Prefer not to Answer

Online & In-Person Experimental Measures

State Anxiety Subscale

1. I feel calm ®
2. I feel secure ®
3. I feel tense
4. I feel strained
5. I feel at ease ®
6. I feel upset
7. I am presently worrying over possible misfortunes

8. I feel satisfied ®
9. I feel frightened
10. I feel uncomfortable
11. I feel self-confident ®
12. I feel nervous
13. I feel jittery
14. I feel indecisive
15. I am relaxed ®
16. I feel content ®
17. I am worried
18. I feel confused
19. I feel steady ®
20. I feel pleasant ®

Positive and Negative Affect Scale (PANAS)

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. https://doi.org/10.1037/0022-3514.54.6.1063

Negative Subscale

In this moment, I feel,

1. Scared

2. Afraid
3. Upset
4. Distressed
5. Jittery
6. Nervous
7. Ashamed
8. Guilty
9. Irritable
10. Hostile

Positive Subscale

1. Interested
2. Excited
3. Strong
4. Enthusiastic
5. Proud
6. Alert
7. Inspired
8. Determined
9. Attentive
10. Active

Approach Motivation

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319-333.

Eftekhari, E., Tran, A., & McGregor, I. (2017). Decentering increases approach motivation among distressed individuals. *Personality and Individual Differences*, *119*, 236-241.

In this moment…

Drive

1. I would go out of my way to get things I want
2. I would go all-out to get something I want
3. If I saw a chance to get something I want, I would move on it right away
4. I would use a "no holds barred" approach to get something I want

Stroop Task

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, *18*(6), 643-662.

Hirsh, J. B., & Inzlicht, M. (2010). Error-related negativity predicts academic performance. *Psychophysiology*, *47*(1), 192-196.

Color Words

Blue, Green, Yellow, Red

Group Evaluations

In this portion of the survey, you will evaluate the members of the group you observed. Please respond honestly to each question item about each group member. Your responses are confidential and will not be shared with the team members.

1. How much did Joe contribute to the problem-solving activity?
2. How much did Joe focus on the problem-solving activity?
3. How much did Joe help the team complete the problem-solving activity?
4. How friendly was Joe?
5. How likeable was Joe?
6. How much did Joe treat his team members with respect?
7. How competent did Joe seem?

1. How much did Matt contribute to the problem-solving activity?
2. How much did Matt focus on the problem-solving activity?
3. How much did Matt help the team complete the problem-solving activity?
4. How friendly was Matt?
5. How likeable was Matt?
6. How much did Matt treat his team members with respect?
7. How competent did Matt seem?

1. How much did Alyssa contribute to the problem-solving activity?
2. How much did Alyssa focus on the problem-solving activity?
3. How much did Alyssa help the team complete the problem-solving activity?
4. How friendly was Alyssa?

5. How likeable was Alyssa?
6. How much did Alyssa treat his team members with respect?
7. How competent did Alyssa seem?

Manipulation Checks

1. Did any group members display sexist behavior while working in the group?
    1. Yes
    2. No

    If yes, which group member(s)? [Free Response]

2. If yes, did anyone confront the sexist behavior while working in the group?

    If yes, which group member(s)? [Free Response]

3. During session where you sat quietly in the middle of the study what did you think about? [Free Response]

Manipulation Scripts

Online Study

[Scene 1; *All conditions*]: A Zoom meeting room with 9 students (8 men, 1 woman).

Male Instructor:

Hello everyone. Thank you for joining us today to help us examine if Zoom breakout rooms are effective platforms to facilitate group work among students in our math courses. There are 9 of you here today, so will have 3 breakout rooms each consisting of 3 students. As we mentioned over email, you and your group members will be asked to solve a mathematical word problem. I will post the problem in the chat once the breakout rooms have opened. You will have as long as you need to solve the problem. Your breakout room will be recorded so that men and women volunteers can evaluate you on your collaboration and whether or not you get the answer correct. Each group will have one evaluator who will watch your recording at a later date. Does anyone have any questions? [Short pause] No. Okay, I am going to randomly assign each of you to a breakout room, once you solve the problem you can come back to this room.

Direct sexism condition

[Scene 2:] A break out room consisting of 3 people (2 men, 1 woman).

Male Confederate 1: Hi everyone I'm Matt, nice to meet you.

Male Confederate 2: I'm Joe.

Woman Confederate: I am Alyssa.

Male Confederate 1: I guess we should get started since we are being evaluated. Who knows how we will do as a group especially if we get a girl evaluator? [Joking Laughter].

[Short pause]

Male Confederate 1: Okay well anyway the problem is: If the sum of the smallest and largest of three consecutives even numbers is 28, what is the value of the numbers in the series?

Male Confederate 2: Well, we first can start by making the smallest number X.

Woman Confederate: Right and we could make the second number X + 2.

Male Confederate 1: That would make the third number X + 2 + 2 or in other words, X + 4.

Woman Confederate: So that means X and X + 4 would equal 28.

Male Confederate 2: Okay so 2x + 4 = 28. We can move the 4 over to get 2x = 24.

Male Confederate 1: Meaning x = 12.

Woman confederate: Okay so the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Sounds good to me.

Male Confederate 1: Yes, the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Okay, let's go back to the Zoom meeting.

[End video]

Witnessing sexism condition

[Scene 2:] A break out room consisting of 3 people (2 men, 1 woman).

Male Confederate 1: Hi everyone I'm Matt, nice to meet you.

Male Confederate 2: I'm Joe.

Woman Confederate: I am Alyssa.

Male Confederate 1: I guess we should get started since we are being evaluated. Who knows how we will do as a group, especially if the other groups are all guys? [Joking Laughter].

[Short pause]

Male Confederate 1: Okay well anyway the problem is: If the sum of the smallest and largest of three consecutives even numbers is 28, what is the value of the numbers in the series?

Male Confederate 2: Well, we first can start by making the smallest number X.

Woman Confederate: Right and we could make the second number X + 2.

Male Confederate 1: That would make the third number X + 2 + 2 or in other words, X + 4.

Woman Confederate: So that means X and X + 4 would equal 28.

Male Confederate 2: Okay so $2x + 4 = 28$. We can move the 4 over to get $2x = 24$.

Male Confederate 1: Meaning $x = 12$.

Woman confederate: Okay so the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Sounds good to me.

Male Confederate 1: Yes, the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Okay, let's go back to the Zoom meeting.

[End video]

Control condition

[Scene 2:] A break out room consisting of 3 people (2 men, 1 woman).

Male Confederate 1: Hi everyone I'm Matt, nice to meet you.

Male Confederate 2: I'm Joe.

Woman Confederate: I am Alyssa.

Male Confederate 1: I guess we should get started since we are being evaluated. [Joking Laughter].

[Short pause]

Male Confederate 1: Okay well anyway the problem is: If the sum of the smallest and largest of three consecutives even numbers is 28, what is the value of the numbers in the series?

Male Confederate 2: Well, we first can start by making the smallest number X.

Woman Confederate: Right and we could make the second number X + 2.

Male Confederate 1: That would make the third number X + 2 + 2 or in other words, X + 4.

Woman Confederate: So that means X and X + 4 would equal 28.

Male Confederate 2: Okay so 2x + 4 = 28. We can move the 4 over to get 2x = 24.

Male Confederate 1: Meaning x = 12.

Woman confederate: Okay so the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Sounds good to me.

Male Confederate 1: Yes, the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Okay, let's go back to the Zoom meeting.

[End video]

Experiment

[Scene 1; *For all conditions*]: A Zoom meeting room with 9 students (8 men, 1 woman).

Male Instructor:

Hello everyone. Thank you for joining us today to help us examine if Zoom breakout rooms are effective platforms to facilitate group work among students in our math courses. There are 9 of you here today, so will have 3 breakout rooms each consisting of 3 students. As we mentioned over email, you and your group members will be asked to solve a mathematical word problem. I will post the

problem in the chat once the breakout rooms have opened. You will have as long as you need to solve the problem. Your breakout room will be recorded so that men and women volunteers can evaluate you on your collaboration and whether or not you get the answer correct. Each group will have one evaluator who will watch your recording at a later date. Does anyone have any questions? [Short pause] No. Okay, I am going to randomly assign each of you to a breakout room, once you solve the problem you can come back to this room.

Without ally support

[Scene 2:] A break out room consisting of 3 people (2 men, 1 woman).

Male Confederate 1: Hi everyone I'm Matt, nice to meet you.

Male Confederate 2: I'm Joe.

Woman Confederate: I am Alyssa.

Male Confederate 1: I guess we should get started since we are being evaluated. Who knows how we will do as a group especially if the other groups are all guys? [Joking Laughter].

[Short pause]

Male Confederate 1: Okay well anyway the problem is: If the sum of the smallest and largest of three consecutive even numbers is 28, what is the value of the numbers in the series?

Male Confederate 2: Well, we first can start by making the smallest number X.

Woman Confederate: Right and we could make the second number X + 2.

Male Confederate 1: That would make the third number X + 2 + 2 or in other words, X + 4.

Woman Confederate: So that means X and X + 4 would equal 28.

Male Confederate 2: Okay so 2x + 4 = 28. We can move the 4 over to get 2x = 24.

Male Confederate 1: Meaning x = 12.

Woman confederate: Okay so the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Sounds good to me.

Male Confederate 1: Yes, the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Okay, let's go back to the Zoom meeting.

[End video]

With ally support

[Scene 2:] A break out room consisting of 3 people (2 men, 1 woman).

Male Confederate 1: Hi everyone I'm Matt, nice to meet you.

Male Confederate 2: I'm Joe.

Woman Confederate: I am Alyssa.

Male Confederate 1: I guess we should get started since we are being evaluated. Who knows how we will do as a group especially if the other groups are all guys? [Joking Laughter].

Male Confederate 2: I think we will do just as good as the other groups. Why does it matter if everyone has all guys in their group?

[Short pause]

Male Confederate 1: Okay well anyway the problem is: If the sum of the smallest and largest of three consecutive even numbers is 28, what is the value of the numbers in the series?

Male Confederate 2: Well, we first can start by making the smallest number X.

Woman Confederate: Right and we could make the second number X + 2.

Male Confederate 1: That would make the third number X + 2 + 2 or in other words, X + 4.

Woman Confederate: So that means X and X + 4 would equal 28.

Male Confederate 2: Okay so $2x + 4 = 28$. We can move the 4 over to get $2x = 24$.

Male Confederate 1: Meaning $x = 12$.

Woman confederate: Okay so the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Sounds good to me.

Male Confederate 1: Yes, the smallest number would be 12, the middle number would be 14, and the largest number would be 16.

Male Confederate 2: Okay, let's go back to the Zoom meeting.

[End video]

Tables

Table 1

Means, Standard Deviations, and One-Way Analyses of Evaluations of the Sexist Male Group Member

Variable	Control		Target		Witness		$F(2, 78)$	p
	M	*SD*	*M*	*SD*	*M*	*SD*		
Contribution	5.00	.05	3.52	1.37	3.72	1.21	12.0	< .001
Focus	5.11	.92	3.96	1.31	3.92	1.23	9.12	< .001
Helpful	4.96	.84	4.04	1.32	3.96	1.22	6.61	.002
Friendliness	4.64	.87	3.93	1.23	3.85	1.19	4.30	.017
Likeability	4.48	1.37	2.59	1.80	2.54	1.77	11.94	< .001
Respect	2.33	1.79	4.75	1.56	2.54	1.79	17.39	< .001
Competence	4.61	1.31	3.19	1.69	2.85	1.38	11.07	< .001

Note. p values represent the significance of the full model.

Table 2

Means, Standard Deviations, and One-Way Analyses of Evaluations of the Female Target Group Member

Variable	Control		Target		Witness		$F(2, 78)$	p
	M	*SD*	*M*	*SD*	*M*	*SD*		
Contribution	4.49	1.14	4.62	1.20	4.28	1.10	0.547940	0.58
Focus	5.00	1.12	4.89	0.97	4.81	1.02	0.232397	0.79
Helpful	4.58	1.17	4.67	1.14	4.56	1.08	0.067353	0.93
Friendliness	4.75	1.17	4.70	1.14	4.54	1.10	0.253544	0.78
Likeability	4.74	1.34	4.48	1.01	4.19	1.41	1.237824	0.30
Respect	5.21	0.96	4.56	1.12	4.69	1.19	2.795675	0.07
Competence	5.00	1.12	4.74	0.94	4.54	1.21	1.206267	0.30

Note. p values represent the significance of the full model.

Table 3

Means, Standard Deviations, and One-Way Analyses of Evaluations of the Female Target Group Member

Variable	Control		Target		Witness		$F(2, 78)$	p
	M	*SD*	*M*	*SD*	*M*	*SD*		
Contribution	4.62	1.13	4.30	0.91	3.88	1.31	2.78	0.07
Focus	4.96	1.35	4.78	0.89	4.62	1.33	0.56	0.57
Helpful	4.64	1.25	4.56	0.80	4.12	1.07	1.89	0.16
Friendliness	4.50	1.37	4.26	1.02	3.80	1.47	1.96	0.15
Likeability	4.39	1.40	4.26	1.06	3.73	1.54	1.81	0.17
Respect	5.07	1.12	4.59	0.97	4.35	1.16	3.13	0.05
Competence	4.96	1.14	4.63	0.68	4.24	1.42	2.78	0.07

Note. p values represent the significance of the full model.

Table 4

Regression analyses results for serial mediation model using state anxiety, self-reported BAS, allyship and Stroop performance.

	State Anxiety			Self-reported BAS (RAM)			Stroop Performance		
	B	ES	CI 95%	B	ES	CI 95%	B	ES	CI 95%
Constant	1.804	.057	[1.691, 1.918]	3.285	.241	[2.808, 3.762]	1.036***	.039	[.960, 1.112]
Allyship	-.124	.079	[-.281, .033]	-.096	.111	[-.316, .124]	-.010	.011	[-.032, .012]
Anxiety				-.243	.126	[-.492, .007]	-.016	.013	[-.042, .009]
Self-reported BAS							-.013	.009	[-.031, .005]
R^2		.020			.033			.029	
F		2.433			2.034			1.200	

Note. N = 123. *CI* = Bootstrapping Confidence Interval.

Table 5

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety, self-reported BAS, allyship and Stroop performance.

	B	ES	CI 95%
Total effect	.003	.003	[-.002, .011]
Direct effect	-.010	.011	[-.032, .012]
Indirect effects through:			
State Anxiety	.002	.003	[-.002, .009]
Self-reported BAS	.001	.002	[-.002, .006]
State Anxiety and Self-reported BAS	.000	.001	[-.002, .000]

Note. N = 123; *CI* = Bootstrapping Confidence Interval.

Table 6

Regression analyses results for serial mediation model using negative mood, self-reported BAS, allyship, and Stroop performance.

	Negative Mood			Self-Reported BAS			Stroop Performance		
	B	ES	CI 95%	B	ES	CI 95%	B	ES	CI 95%
Constant	12.893	.436	[12.030,13.756]	3.038	.231	[2.581,3.495]	1.029	.037	[.956,1.101]
Allyship	-1.012	.591	[-2.182, .157]	.003	.110	[-.216,.222]	-.007	.011	[-.029, .015]
Negative Mood				-.019	.017	[-.052,.015]	-.002	.002	[-.005,.002]
Self-Reported BAS							-.014	.009	[-.032,.004]
R^2		.024				.010		.026	
F		2.935				.630		1.072	

Note. N = 123; *CI* = Bootstrapping Confidence Interval.

Table 7

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, self-reported BAS, allyship, and Stroop performance.

	B	*ES*	*CI 95%*
Total effect	.001	.003	[-.004,.008]
Direct effect	-.007	.011	[-.029, .015]
Indirect effects through:			
Negative mood	.002	.002	[-.002,.007]
Self-reported BAS	.000	.002	[-.004,.004]
Negative mood and self-reported BAS	.000	.000	[-.002, .000]

Note. $N = 127$; *CI* = Bootstrapping Confidence Interval.

Table 8

Regression analyses results for serial mediation model using state anxiety, alpha hemispheric activity, allyship, and Stroop performance.

	State Anxiety			Alpha Hemispheric Activity			Stroop Performance		
	B	ES	CI 95%	B	ES	CI 95%	B	ES	CI 95%
Constant	1.801	.058	[1.687, 1.915]	.001	.029	[-.056, .059]	.999***	.024	[.951, 1.048]
Allyship	-.102	.081	[-.262, .057]	.010	.013	[-.017, .036]	-.011	.011	[-.033, .011]
State Anxiety				.003	.015	[-.027, .034]	-.017	.013	[-.042, .009]
Alpha Hemispheric Activity							.145	.078	[-.008, .299]
Covariates:									
Baseline Alpha Hemispheric Activity	-.068	.121	[-.308, .172]	.951	.020	[.911, .991]	-.157	.076	[-.307, -.007]
R^2		.017			.951			.057	
F		1.042			753.325			1.724	

Note. N = 120; *CI* = Bootstrapping Confidence Interval.

Table 9

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety, alpha hemispheric activity, allyship, and Stroop performance.

	B	*ES*	*CI 95%*
Total effect	.003	.003	[-.002, .011]
Direct effect	-.011	.011	[-.033, .11]
Indirect effects through:			
State anxiety	.002	.003	[-.002, .009]
Alpha Hemispheric Activity	.001	.002	[-.002, .006]
State anxiety and alpha hemispheric activity	.000	.000	[-.001, .001]

Note. $N = 120$; *CI* = Bootstrapping Confidence Interval.

Table 10

Regression analyses results for serial mediation model using negative mood, alpha hemispheric activity, allyship, and Stroop performance.

	Negative Mood			Alpha Hemispheric Activity			Stroop Performance		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	12.975	.441	[12.102, 13.848]	.000	.029	[-.057, .056]	.991	.024	[.943, 1.039]
Allyship	-1.239	.614	[-2.455, -.023]	.010	.014	[-.017, .037]	-.011	.012	[-.034, .013]
Negative Mood				.001	.002	[-.004, .005]	-.002	.002	[-.005, .002]
Alpha Hemispheric Activity							.145	.079	[-.012, .303]
Covariates									
Baseline Alpha Hemispheric Activity	.296	.915	[-1.516, 2.108]	.951	.020	[.911, .991]	-.155	.077	[-.308, -.001]
R^2		.035			.952			.049	
F		2.047			745.110			1.431	

Note. N = 120; *CI* = Bootstrapping Confidence Interval.

Table 11

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, alpha hemispheric activity, allyship, and Stroop performance.

	B	*ES*	*CI 95%*
Total effect	.003	.003	[-.002, .011]
Direct effect	-.011	.012	[-.034, .013]
Indirect effects through:			
Negative mood	.002	.003	[-.002, .009]
Alpha Hemispheric Activity	.001	.002	[-.003, .006]
Negative mood and Alpha hemispheric activity	.000	.001	[-.001, .001]

Note. N = 120; *CI* = Bootstrapping Confidence Interval.

Table 12

Regression analyses results for serial mediation model using state anxiety, self-reported BAS, allyship, and Stroop response time.

	State Anxiety			Self-Reported BAS			Stroop Response Time		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	1.804	.057	[1.691,1.918]	3.285	.241	[2.808, 3.762]	413.413	273.216	[-127.583, 954.409]
Allyship				-.096	.111	[-.316,.124]	6.728	79.159	[-150.014, 163.470]
Anxiety				-.243	.126	[-.492,.007]	169.139	90.892	[-10.836, 349.114]
Self-reported BAS							57.928	64.848	[-70.477, 186.333]
R^2		.020			.033			.031	
F		2.433			2.034			1.284	

Note. N = 123; *CI* = Bootstrapping Confidence Interval.

Table 13

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety and self-reported BAS, allyship, and Stroop response time.

	B	*ES*	*CI 95%*
Total effect	-24.769	26.541	[-94.586, 7.573]
Direct effect	6.728	79.159	[-150.014, 163.470]
Indirect effects through:			
State Anxiety	-20.934	25.617	[-88.745, 5.971]
Self-reported BAS	-5.575	8.364	[-25.319, 9.770]
State anxiety and Self-reported BAS	1.739	2.303	[-.522, 8.029]

Note. N = 123; *CI* = Bootstrapping Confidence Interval.

Table 14

Regression analyses results for serial mediation model using negative mood, self-reported BAS, allyship, and Stroop response time.

	Negative Mood			Self-Reported BAS			Stroop Response Time		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	12.89	.436	[12.030,13.756]	3.038	.231	[2.581, 3.495]	810.983	266.899	[282.496, 1339.470]
Allyship	-1.01	.591	[-2.182,.157]	.003	.110	[-.216, .222]	-13.438	81.665	[-175.144, 148.268]
Negative Mood				-.019	.017	[-.052, .015]	-2.226	12.479	[-26.936, 22.484]
State RAM							35.692	67.506	[-97.976, 169.360]
R^2		.024				.010		.003	
F		2.935				.630		.117	

Note. N = 123; *CI* = Bootstrapping Confidence Interval.

Table 15

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, self-reported BAS, allyship, and Stroop response time.

	B	*ES*	*CI 95%*
Total effect	3.031	10.992	[-17.422, 29.014]
Direct effect	-13.438	81.665	[175.144, 148.268]
Indirect effects through:			
Negative mood	2.253	8.483	[-13.825, 22.583]
Self-reported BAS	.108	6.231	[-13.249, 14.091]
Negative mood and Self-reported BAS	.670	1.396	[-1.404, 4.385]

Note. $N = 123$; *CI* = Bootstrapping Confidence Interval.

Table 16

Regression analyses results for serial mediation model using state anxiety, alpha hemispheric activity, allyship, and Stroop response time.

	State Anxiety			Alpha Hemispheric Activity			Stroop Response Time		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	1.801	.058	[1.687, 1.915]	.001	.029	[-.056, .059	567.349	177.605	[215.547, 919.150]
Allyship	-.102	.081	[-.262, .057]	.010	.013	[-.017, .036]	-.295	81.919	[-162.560, 161.971]
Anxiety				.003	.015	[-.027, .034]	171.916	93.210	[-12.717, 356.548]
Alpha Hemispheric Activity Covariate							-220.712	564.467	[-1338.814, 897.389]
Baseline Alpha Hemispheric Activity	-.068	.121	[-.308, .172]	.951	.020	[.911, .991]	299.778	550.413	[-790.485, 1390.041]
R^2		.017			.951			.033	
F		1.042			753.325			.993	

Note. $N = 120$; *CI* = Bootstrapping Confidence Interval.

Table 17

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety, alpha hemispheric activity, allyship, and Stroop response time.

	B	*ES*	*CI 95%*
Total effect	-19.689	23.965	[-81.535, 11.743]
Direct effect	-.295	81.919	[-162.560, 161.971]
Indirect effects through:			
State Anxiety	-17.586	24.898	[-84.995, 9.358]
Alpha Hemispheric Activity	-2.175	8.063	[-17.860, 16.949]
State anxiety and alpha hemispheric activity	.072	1.196	[-1.492, 3.122]

Note. $N = 123$; *CI* = Bootstrapping Confidence Interval.

Table 18

Regression analyses results for serial mediation model using negative mood, alpha hemispheric activity, allyship, and Stroop response time.

	Negative Mood			Alpha Hemispheric Activity			Stroop Response Time		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	12.975	.441	[12.102, 13.848]	.000	.029	[-.057, .056]	911.602	177.917	[559.082, 1264.122]
Allyship	-1.239	.614	[-2.455, -.023]	.010	.014	[-.017, .037]	-20.055	86.184	[-190.818, 150.708]
Negative Mood				.001	.002	[-.004, .005]	-2.726	12.895	[-28.277, 22.824]
Alpha Hemispheric Activity Covariate							-195.680	585.278	[-1355.336, 963.976]
Baseline Alpha Hemispheric Activity	.296	.915	[-1.516, 2.108]	.951	.020	[.911, .991]	265.641	570.518	[-864.770, 1396.052]
R^2		.035			.952			.005	
F		2.047			745.110			.144	

Note. N = 120; *CI* = Bootstrapping Confidence Interval.

Table 19

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, alpha hemispheric activity, allyship, and Stroop response time.

	B	*ES*	*CI 95%*
Total effect	1.568	13.542	[-23.056, 33.502]
Direct effect	-20.055	86.184	[-190.818, 150.708]
Indirect effects through:			
Negative Mood	3.379	10.277	[-17.604, 26.592]
Alpha Hemispheric Activity	-1.954	8.130	[-17.495, 17.185]
Negative mood and alpha hemispheric activity	.143	1.756	[-2.935, 4.117]

Note. $N = 120$; *CI* = Bootstrapping Confidence Interval.

Table 20

Regression analyses results for serial mediation model using state anxiety, alpha hemispheric activity, allyship, and ERN amplitude difference.

	State Anxiety			Alpha Hemispheric Activity			ERN Amplitude Differences		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	1.720	.119	[1.477, 1.962]	.027	.067	[-.109, .164]	.904	3.841	[-6.940, 8.747]
Allyship	-.204	.126	[-.460, .052]	.011	.027	[-.044, .065]	-.476	1.539	[-3.619, 2.667]
Anxiety				.019	.036	[-.055, .093]	-.426	2.083	[-4.680, 3.829]
Alpha Hemispheric Activity Covariates							-7.175	10.262	[-28.133, 13.783]
Baseline Alpha Hemispheric Activity	.017	.550	[-1.103, 1.137]	.694	.113	[.463, .924]	.765	9.608	[-18.857, 20.387]
R^2		.079			.565			.038	
F		1.363			13.443			.295	

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 21

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety, alpha hemispheric activity, allyship, and ERN amplitude differences.

	B	*ES*	*CI 95%*
Total effect	.039	.565	[-1.298, 1.070]
Direct effect	-.476	1.539	[-3.619, 2.667]
Indirect effects through:			
State Anxiety	.087	.434	[-.810, 1.046]
Alpha Hemispheric Activity	-.075	.407	[-1.277, .479]
State anxiety and alpha hemispheric activity	.027	.115	[-.253, .232]

Note. N = 35; *CI* = Bootstrapping Confidence Interval.

Table 22

Regression analyses results for serial mediation model using state anxiety, self-reported BAS, allyship, and ERN amplitude difference.

	State Anxiety			Self-reported BAS			ERN amplitude differences		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	1.722	.089	[1.540, 1.904]	3.106	.503	[2.081, 4.131]	-2.396	5.474	[-13.562, 8.769]
Allyship	-.203	.121	[-.450, .043]	.101	.203	[-.313, .516]	-.827	1.501	[-3.888, 2.233]
Anxiety				-.189	.280	[-.759, .382]	-.413	2.073	[-4.641, 3.815]
Self-reported BAS							.814	1.299	[-1.837, 3.464]
R^2		.078			.029			.021	
F		2.811			.483			.220	

Note. N = 35; *CI* = Bootstrapping Confidence Interval.

Table 23

Summary of indirect effects of serial mediation model with the bootstrapping method using state anxiety, self-reported BAS, allyship, and ERN amplitude differences.

	B	*ES*	*CI 95%*
Total effect	.198	.526	[-.775, 1.404]
Direct effect	-.827	1.501	[-3.888, 2.233]
Indirect effects through:			
State Anxiety	.084	.445	[-.749, 1.122]
Self-reported BAS	.083	.317	[-.430, .915]
State anxiety and Self-reported BAS	.031	.107	[-.171, .277]

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 24

Regression analyses results for serial mediation model using state anxiety, self-reported BAS, allyship, and ERN amplitude difference.

	Negative Mood			Self-reported BAS			ERN amplitude Differences		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	13.000	.621	[11.734, 14.266]	3.201	.551	[2.075, 4.326]	-3.860	6.250	[-16.642, 8.922]
Allyship	-2.222	.840	[-3.936, -.508]	.159	.212	[-.274, .592]	-1.415	1.666	[-4.823, 1.993]
Negative mood				-.037	.041	[-.121, .046]	-.054	.323	[-.715, .607]
Self-reported BAS							1.434	1.421	[-1.472, 4.340]
R^2		.184			.075			.050	
F		6.993			1.208			.512	

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 25

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, self-reported BAS, allyship, and ERN amplitude differences.

	B	*ES*	*CI 95%*
Total effect	.466	.805	[-1.239, 2.029]
Direct effect	-1.415	1.666	[-4.823, 1.993]
Indirect effects through:			
Negative mood	.119	.711	[-1.345, 1.543]
Self-reported BAS	.228	.469	[-.466, 1.449]
Negative mood and Self-reported BAS	.119	.179	[-.243, .504]

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 26

Regression analyses results for serial mediation model using state anxiety, alpha hemispheric activity, allyship, and ERN amplitude difference.

	Negative Mood			Alpha Hemispheric Activity			ERN Amplitude Differences		
	B	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*	*B*	*ES*	*CI 95%*
Constant	13.659	.803	[12.019, 15.298]	.046	.085	[-.127, .219]	2.766	4.783	[-7.032, 12.563]
Allyship	-2.045	.844	[-3.768, -.322]	.010	.030	[-.051, .071]	-1.034	1.679	[-4.473, 2.405]
Negative mood				.001	.006	[-.011, .013]	-.167	.332	[-.847, .512]
Alpha hemispheric activity							-7.061	10.443	[-28.454, 14.332]
Covariates									
Baseline Alpha Hemispheric Activity	-4.675	3.669	[-12.168, 2.818]	.692	.122	[.443, .941]	-1.144	9.954	[-21.534, 19.246]
R^2		.226			.550			.058	
F		4.379			11.807			.435	

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 27

Summary of indirect effects of serial mediation model with the bootstrapping method using negative mood, alpha hemispheric activity, allyship, and ERN amplitude differences.

	B	*ES*	*CI 95%*
Total effect	.283	.804	[-1.644, 1.534]
Direct effect	-1.034	1.679	[-4.473, 2.405]
Indirect effects through:			
Negative mood	.342	.713	[-1.333, 1.582]
Alpha Hemispheric Activity	-.071	.437	[-1.351, .460]
State anxiety and alpha hemispheric activity	.012	.192	[-.400, .374]

Note. $N = 35$; *CI* = Bootstrapping Confidence Interval.

Table 28

Post Hoc Analyses of the Differences between Evaluations of the Sexist Male.

	Without Ally Support		With Ally Support		t(122)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Contribution	4.27	1.31	4.55	1.06	2.68	.051	.50
Focus	3.85	1.07	3.67	1.14	.90	.317	.17
Help	3.78	1.07	3.36	1.27	1.96	.052	.51
Friendliness	2.80	1.40	2.75	1.37	1.98	.844	.03
Likeability	2.37	1.36	2.22	1.26	.648	.518	.12
Respect	2.40	1.51	2.38	1.50	.061	.952	.01
Competence	3.49	1.33	3.31	1.36	.754	.452	.14

Note. P values represent the significance of the model.

Table 29

Post Hoc Analyses of the Differences between Evaluations of the Female Target of Sexism.

	Without Ally Support		With Ally Support		t(122)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Contribution	4.00	1.20	4.22	1.07	-1.05	.296	-.19
Focus	4.07	1.35	4.48	1.13	-1.80	.074	-.33
Help	4.00	1.21	4.37	1.07	-1.74	.085	-.32
Friendliness	4.10	1.22	4.40	1.05	-1.45	.150	-.27
Likeability	3.77	1.29	4.44	1.02	-3.15	.002**	-.58
Respect	4.28	1.15	4.68	.97	-2.06	.081	-.38
Competence	4.27	1.31	4.55	1.06	-1.30	.197	-.24

Note. P values represent the significance of the model.

Table 30

Differences between evaluations of the male bystander/ally

	Without Ally Support		With Ally Support		t(122)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Contribution	3.92	1.14	4.25	1.08	-1.64	.363	-.17
Focus	4.27	1.04	4.43	.963	-.91	.198	-.24
Help	3.98	1.12	3.97	1.10	-1.30	.004**	-.54
Friendliness	3.97	1.10	4.57	1.11	-2.97	.001**	-.54
Likeability	3.98	1.11	4.66	1.15	-3.26	< .001***	-.60
Respect	4.29	1.19	5.08	.97	-3.99	.003**	-.73
Competence	4.17	1.21	4.81	1.39	-3.04	.103	-.56

Note. P values represent the significance of the model.