Stress and Well-Being at Work: A Century of Empirical Trends Reflecting Theoretical and Societal Influences

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In various forms, research on stress and well-being has been a part of the *Journal of Applied Psychology (JAP)* since its inception. In this review, we examine the history of stress research in *JAP* by tracking word frequencies from 606 abstracts of published articles in the journal. From these abstracts, we define 3 eras: a 50 year-era from 1917 to 1966, a 30-year era from 1967 to 1996, and a 20-year era from 1997 to the present. Each era is distinct in terms of the number of articles published and the general themes of the topic areas examined. We show that advances in theory are a major impetus underlying research topics and the number of publications. Our review also suggests that articles have increasingly tended to reflect broader events occurring in society such as recessions and workforce changes. We conclude by offering ideas about the future of stress and well-being research.

Keywords: stress, stressors, strain, health, well-being

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April 6, 1917: the U.S. enters the Great War—a war that required another global war before earning the name "World War I." Roughly 1 year later, an influenza epidemic kills over 500,000 U.S. citizens. In the following year, the nation's concerns about alcohol abuse lead to a 14-year period of prohibition. Twelve years after 1917, the stock market crash of 1929 triggers the great depression, and tens of thousands remain unemployed for years.

By most objective standards, the decades following the inception of the *Journal of Applied Psychology (JAP)* were a remarkably stressful period for workers (and citizens) in the U.S. and much of the world. With these events as backdrop, one would expect to find that the topic of stress dominated the early pages of *JAP*. Perhaps not surprisingly, the story is more complicated: The journal does indeed reflect the influence of stressors occurring within society, but research on stress and well-being in work contexts was relatively rare for approximately the first 50 years, though traces of what we now view as stress research can be seen as early as 1917.

For instance, Fish (1917) discussed the challenges of maintaining a skilled workforce "as the country is drawn into war" (p. 161) and noted concerns about alcohol consumption by stating that

> [i]t goes without saying in these days that no employer wishes to have any of his men under the influence of liquor . . . because we all realize now that a man is stupefied to some extent even by what is known as moderate drinking. (p. 165)

Fish went on to write that the "first essential" for meeting labor demands is that the "shop shall be comfortable in both a physical and a mental way" (p. 162). Fish's interests in stress and well-being were consistent with the broader "mental hygiene" movement of the time (e.g., Martin, 1917). Martin advocated an expansive agenda, arguing that

> [b]y mental hygiene I mean the psychological work to be done in creating, maintaining, and restoring normal mental activity in a given individual. There are many reasons why our association should immediately take the lead, set the pace as it were, in this matter of mental hygiene. (p. 67)

A final example of the traces of what we recognize as stress research is reflected in Hall's (1917) description of soldiers' stress reactions to the demands of war. Hall wrote

> We shall surely have a new and larger psychology of war. The older literature on it is already more or less obsolete from almost every point of view, and James' theory of a moral, and Cannon's of a physiological, equivalent of war seem now pallid and academic. (p. 12)

Although there was clearly an early impetus to focus on factors related to stress and well-being, the research evidence suggests the

agenda was not widely adopted in the early years of *JAP*. Furthermore, published articles during the early decades failed to reflect the broad visions proposed by individuals such as Hall, Martin, and Fish. Instead, articles we recognize as stress research tended to examine demographic variables such as age, race, profession, and physical activity as predictors of outcomes such as mental fatigue and psychoneurotic symptoms (e.g., Garth, 1920; Elwood, 1927). While these types of articles laid the foundations for future work, they did not really capture the calls to "immediately take the lead" with respect to "maintaining and restoring" mental hygiene by Martin, meeting the "first essential" for "comfortable" shops advocated by Fish, or advancing a "new and larger psychology of war" anticipated by Hall.

Based on our review, it took 16 years for the journal to publish a study that can be clearly identified as having both a work-relevant stressor and strain. Laird (1933) experimentally examined the effects of loud noise (an organizational stressor) and noted that loud noise appeared to cause somatic complaints (a strain). Laird wrote that "[w]ith the more intense noises muscular stiffness was noted, especially in the neck and legs" (p. 328) and speculated that the stiffness was due to an accumulation of lactates, given that "[n]either of these groups of muscles was used during the work period . . ." (p. 328). Laird's examination of work stressors and strains associated with the industrial age was followed by others, but the number of publications was relatively small for another 30 or so years at which point (the mid to late 1960s) the rate of publications increased substantially.[1]

In this review, we follow the development of stress and well-being research published in *JAP* over the past 100 years. We examine how publication trends were influenced by larger societal events and developments in stress theory. The foundation of our review is based upon 606 stress-related articles published in *JAP* from 1917 to present.

The structure is as follows: First, we define key terms that fall within the domain of our review. Second, we examine significant historic events and macro societal trends that frame stress research. Third, we identify important developments in theory related to stress and well-being. Fourth, we examine articles published in the journal during the past 100 years and consider how these publications relate to events in society and advances in theory. As part of our review, we identify articles that we consider exemplary and influential. Finally, we summarize the first century, take stock of theoretical and empirical research, and discuss future directions.

Defining Key Terms

When summarizing theory and empirical research on stress and well-being, one of the key challenges involves the varied interpretations of key terms. The term "stress," in particular, has multiple meanings, referring to a condition or event in the situation, the person's reaction to the situation, or the relationship between the person and situation (Hobfoll, 1989; Jex, Beehr, & Roberts, 1992; McGrath, 1970). For this reason, stress research often differentiates stressors (conditions and events causing subsequent reactions), perceived stress (perception and appraisal of the stressors), and strains (psychological, physiological, and behavioral outcomes). Research in the domain of stress and well-being has also focused extensively on moderators—attributes of the individual or work environment that alter the strength of links between stressors, perceived stress, and strains. Therefore, in this review, we differentiate among stressors, perceived stress, strain, and moderators and reserve the term "stress" to designate the domain of stress research (cf. Beehr & Newman, 1978; Kahn & Byosiere, 1992).

Historic Events and Macro Societal Trends

Scientific journals vary in the degree to which published articles are expected to mirror broad societal events. However, it is reasonable to assume that, as an applied journal, *JAP* would publish articles that reflect societal events. Based on this assumption, we assembled a chronology of major events that would ostensibly have signified stressors and engendered strain in the working population. Online Appendix A lists these events, and we supplement these events by identifying systemic changes in society that span the time frame of our review.

Macro Societal Trends

As a whole, the century between 1917 and 2017 represented a period of major political, economic, technological, and societal change. Major historic events include two world wars and other significant conflicts (e.g., Korean War, Vietnam War). The century also witnessed the emergence of new nations, mainly in Africa and Asia, along with the rise and fall of the Soviet Union. Concurrent with these events, people faced economic turbulence. The Great Depression (1929–1939) had major impacts on many countries, and in the U.S., the gross national product dropped substantially while the unemployment rate exceeded 20%.

Technology transformed how people lived and worked. In the early 20th century, industrial work was dominated by mass production, enabled by the assembly line popularized by the Ford Motor Company in 1913. During the subsequent decades, rationalization of tasks and jobs continued (Davis & Taylor, 1972). These developments triggered employee reactions such as alienation invoking feelings of powerlessness, meaninglessness, social isolation, and self-estrangement (Shepard, 1977). Signs of these effects include large-scale strikes in 1946 and the seizure of U.S. steel mills to avoid strikes in 1952 (online Appendix A).

Throughout the century, information and communication technology influenced all areas of the economy. The introduction of mainframe computers in the 1960s had relatively limited effects, but the subsequent development of microprocessors led to pervasive changes. For instance, the manufacturing industry witnessed the introduction of computer-aided design, computerized numerically controlled machine tools, and industrial robots. Administrative jobs substantially changed with the advent of personal computers following the release of the IBM PC in 1981. The use of computerized communication technologies accelerated after commercial Internet providers increasingly entered the market in the late 1980s documented by the increase in Internet users worldwide from 394 million in 2000 to 2.94 billion in 2014 (Statista, 2015).

With these technological changes, many jobs were no longer restricted to one location (e.g., onsite offices) and could instead be

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[1] As a point of interest, we note that Laird is one of the top 25 stress-related articles for citation rates in the first 50 years of the journal (see online Appendix B).

conducted in other places, such as the home. On the one hand, this trend contributed to telecommuting arrangements that had the potential to increase individual autonomy and reduce work–family conflict and role stress (Gajendran & Harrison, 2007). On the other hand, mobile devices enabled employees in many jobs to work "anywhere, anytime" and stay electronically tethered to work outside formal working hours. These changes in work patterns created situations in which the boundaries between work and life became permeable, a development with both positive and negative implications for stress experiences.

Several other major changes occurred during the 20th century. First, jobs in the primary and secondary economic sectors (extracting raw materials and producing goods) steadily declined, while jobs in the tertiary (or service sector) increased, particularly in the Western world. Notably, in the U.S. the percentage of employees working in the service sector increased from around 65% in 1961 to over 85% in 2010. This shift accompanied changes in job requirements and job stressors, such as reduced physical and environmental stressors (e.g., Laird, 1933) and increased stressors related to emotional labor (Pugliesi, 1999).

Second, the participation of women in the labor market grew dramatically. In 1920, about 20% of the female U.S. population was employed. This figure rose to 60% in 2000, with the largest increase occurring between 1960 and 1980. As a result, men and women living in dual-earner families had to deal with changes in work and nonwork roles and responsibilities, leading to increases in conflict between work and family (e.g., Higgins, Duxbury, & Irving, 1992).

Third, during the second half of the 20th century, the economy became increasingly global. This development was accompanied by global competition that arguably contributed to an increase in stressors such as workload, job insecurity, and downsizing. Globalization was also associated with increased international mobility of individuals, often leading to stressful experiences for those adjusting to new cultures and work environments (Silbiger & Pines, 2014).

Taken together, these political, economic, technological, and societal developments had broad and significant effects on people's lives in and outside of work. These events provide a backdrop against which theoretical and empirical research on work-related stress grew and developed over the century.

Key Theoretical Models

General Theories of Psychological Stress

The founding of *JAP* in 1917 roughly coincided with the beginnings of theory development in contemporary stress research. Most of these early developments originated outside of the organizational literature but were eventually integrated into research on stress in work settings. We first summarize key theoretical models in the literature on psychological stress in general and then turn to models devoted to stress in work settings.

Historical accounts of the stress field (e.g., Cooper & Dewe, 2004; Lazarus, 1993; Mason, 1975a, 1975b) often trace the origins of stress research to Cannon (1915), who coined the phrase "fight or flight" to describe an organism's response to an external threat. Cannon (1932) later indicated that the response to threat represents deviation from homeostasis, which he viewed as the self-regulation of

physiological processes. A subsequent landmark is the work of Selye (1936), who described reactions to stress in terms of the general adaptation syndrome (GAS), which referred to the nonspecific response of the body to any demand. According to Selye, the GAS comprised three stages that included alarm, resistance, and exhaustion—the first two of which involved attempts to adapt to the demand, and the third indicating depletion of adaptive energy. Like Cannon, Selye focused on physiological responses to stress, such as changes in adrenaline, cortisol, and other hormones.

In the 1960s, the field of stress research experienced a noticeable shift as it began to focus on major life events that required adjustment and led to psychological and physical illness (Dohrenwend & Dohrenwend, 1981; Thoits, 1983). This research was stimulated by the development of the Social Readjustment Rating Scale (SRRS; Holmes & Rahe, 1967), a checklist that comprised 43 stressful life events. Scores on the SRRS were weighted by the amount of readjustment each event was deemed to require and summed to derive an overall measure of life stress. The SRRS has been used in numerous studies (Dohrenwend, 2006), although its relationships with mental and physical symptoms were generally modest, with correlations rarely exceeding .30.

The modest relationships between life events and illness prompted investigations into factors that might moderate these relationships, such as personality, self-esteem, social support, Type-A behavior, and the meaning of the event to the individual (Cohen & Edwards, 1989; Cohen & Wills, 1985; Kessler, Price, & Wortman, 1985). Research showed that the relationship between life events and outcomes depended on event timing and magnitude as well as the undesirability and perceived control over the events (Mullen & Suls, 1982; Thoits, 1983; Vinokur & Selzer, 1975). As such, this research began to underscore the essential role of individual differences in the stress process, a theme that permeated subsequent theoretical work.

Arguably, one of the most influential theoretical models of psychological stress was the transactional theory presented by Lazarus in 1966 and later expanded by Lazarus and Folkman in 1984 (Lazarus, 1966; Lazarus & Folkman, 1984). Lazarus' theory reinforced the importance of subjective factors in the stress process and asserted that the effects of potential stressors on well-being were largely determined by how they were cognitively appraised by the individual. Lazarus distinguished two forms of cognitive appraisal: (a) primary appraisal, which determined whether a potential stressor was viewed as harmful, threatening, or challenging; and (b) secondary appraisal, which considered what individuals might do to manage the stressful transaction. Lazarus' work also placed particular emphasis on the ways in which individuals cope with stress (e.g., Lazarus, 1993; Lazarus, Averill, & Opton, 1974). Lazarus contrasted coping styles, which are individual differences that characterize how people cope, with coping processes, which focus on the particular approaches people use to manage stressful transactions between the person and situation. This work stimulated the development of measures designed to assess the variety of processes by which people cope with stress, of which the Ways of Coping Questionnaire (Folkman & Lazarus, 1988) became the most widely used.

The central importance of cognitive appraisal underscored by Lazarus was maintained in subsequent theoretical work. A prime example is the conservation of resources (COR) theory proposed by Hobfoll (1989). This theory posits that stress occurs when

resources the individual considers valuable are threatened, lost, or foregone. Resources in COR theory refer to objects, conditions, and personal characteristics that are valued in their own right or because they can help the individual achieve or protect other valued resources. COR theory was initially framed as an alternative to appraisal-based theories, such as Lazarus' transactional theory, by placing greater emphasis on the objective environment as a determinant of stress. Nonetheless, cognitive appraisal plays a key role in the evaluation of resources, the perception that resources are at risk, and other basic processes involved in COR theory. Although some researchers have argued that certain symptoms of strain, such as affective arousal, might not require cognitive appraisal as a precursor (Zajonc, 1984), most contemporary theories of stress indicate that appraisal plays a key role in translating experienced stressors into strains and coping processes (Lazarus, 1984).

Theories of Stress in Work Contexts

Many of the theoretical developments in research on psychological stress have parallels in theories that focus on stress in the workplace. For example, Bhagat (1983) proposed a model of the effects of stressful life events on individual performance, satisfaction, and adjustment in organizational settings and developed a checklist that distinguished potentially stressful events associated with job and personal domains (Bhagat, McQuaid, Lindholm, & Segovis, 1985). Other frameworks have focused on work stressors that represent ongoing conditions rather than acute life events. For instance, the reviews of job stress research by Cooper and Marshall (1976) and Beehr and Newman (1978) were seminal publications presenting frameworks that identified various job characteristics considered sources of stress. These frameworks also include individual differences that can modify the effects of job stressors, many of which overlap with those examined in psychological stress research. In a similar vein, Karasek (1979; Karasek & Theorell, 1990) developed a model that focused on two key job characteristics, job demands and job decision latitude, predicting that mental strain is the product of high demands coupled with low decision latitude. Along similar lines, Frankenhaeuser and colleagues (Frankenhaeuser & Gardell, 1976; Frankenhaeuser & Johansson, 1986) established a program of research that examined stress in terms of job demands relative to worker control in industrial settings, with particular emphasis on psychobiological outcomes. Analogously, the challenge-hindrance approach to job stress (Cavanaugh, Boswell, Roehling, & Boudreau, 2000; LePine, LePine, & Jackson, 2004) classifies work-related demands and circumstances as challenges or hindrances based on whether they bring about gains or losses for the employee.

Other theories of stress at work emphasize the role of cognitive appraisal, echoing the theories of psychological stress set forth by Lazarus, Hobfoll, and others. A notable example is the theory of role stress by Kahn and colleagues (Kahn & Quinn, 1970; Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964), which examines how characteristics of organizational roles (e.g., conflict, ambiguity, overload) are perceived and experienced as stressors by role incumbents, leading to affective and physiological symptoms as well as coping responses. Likewise, the person–environment (P–E) fit theory of job stress (French, Caplan, & Van Harrison, 1982) distinguishes objective person and environment factors from their subjective counterparts and emphasizes the fit between the subjective person and environment as the key determinant of psychological, physiological, and behavioral strains along with coping and defense mechanisms. Similarly, the cybernetic theories of work-related stress proposed by Cummings and Cooper (1979) and Edwards (1992) frame stress as a discrepancy between perceptions and important desires which lead to psychological and physical symptoms and efforts to resolve perceived discrepancies. Along similar lines, the conceptualization of stress in organizations presented by Schuler (1980) posits that stress exists when a person is confronted with demand, constraint, or opportunity for being, having, or doing what he or she desires, which leads to psychological, physical, and behavioral symptoms as well as efforts to reduce stress and its deleterious effects.

As noted above, theories of work stress that emphasize cognitive appraisal often posit that stress not only influences strains and illness but also triggers coping efforts directed at the sources of stress. Strategies for coping with work-related stress have been discussed (e.g., Dewe, O'Driscoll, & Cooper, 2010; Latack & Havlovic, 1992), and various frameworks have been presented that distinguish basic forms of coping, such as control, escape, and symptom management (Latack, 1986) and rational task-oriented behavior, emotional release, distraction, passive rationalization, social support (Dewe & Guest, 1990). Some discussions take a more focused approach by addressing how people cope with specific sources of work-related stress, such as job loss (Latack, Kinicki, & Prussia, 1995) and work–family conflict (Wiersma, 1994). Although coping with work stress has been addressed from a theoretical standpoint, relatively few studies of work stress have provided a detailed analysis of how people cope with stress.

As with research on stressful life events, many studies of job stress have examined moderator variables that can influence relationships between stressors, perceived stress, and outcomes. These variables include individual differences such as personality (Parkes, 1994), locus of control (Marino & White, 1985), self-esteem (Ganster & Schaubroeck, 1991), and Type A behavior pattern (e.g., Edwards, Baglioni, & Cooper, 1990, and the *JAP* monograph Ganster, Schaubroeck, Sime, & Mayes, 1991) as well as contextual variables, particularly social support (House, 1981; Viswesvaran, Sanchez, & Fisher, 1999).

In summary, the development of stress theories, both in general and within the domain of work, has followed a progression that can be traced using the broad classes of variables we used to define the stress process. This progression begins with identifying stressors and associated strains, delves into the cognitive appraisal processes by which stress is perceived, and introduces variables that moderate the linkages between stressors, perceived stress, and strains. We use this summary of theories as a backdrop against which to review stress research that has appeared in *JAP*. Our review also takes into account the chronology of historical events that have implications for work stress, as presented in the preceding section.

Empirical Word Counts

We examined macro trends over time using 606 *JAP* articles identified using an "OR" operator on the search terms "stressor," "stress," "strain," "well-being," "mental health," "physical health," "illness," "fatigue," "mental hygiene," "anxiety," and "depression." The abstracts from the 606 articles were subjected to word

frequency counts using the tm package for R (Feinerer, Hornik, & Meyer, 2008, R Core Team, 2014). While the search terms identify the broader class of relevant literature, the word count frequencies from abstracts provide insight into specific research topics and contexts. That is, the key words in the search terms identified the relevant sample of published research, and the word count frequency gives specific insights into how researchers applied the concepts. In this way, the work–count frequencies help capture societal, theoretical, and empirical trends in stress research across the 100 years of our review.

Our goal was to cast a broad net capturing commentaries, book reviews, and empirical studies related to stress and well-being. The specific search terms were selected based on: (a) an article-by-article examination of the first 10 years of published articles; (b) an examination of articles every fifth year through the 1960s; and (c) our knowledge of terms used in influential books and articles. It was important to directly examine early articles because some relevant studies used terms such as "mental hygiene" and "mental fatigue" that would not be identified using terms from the contemporary stress literature.

The original query returned 642 matches. We eliminated 36 articles that triggered false positives, as when the word "stress" was used as a synonym for "emphasize" as in "the authors stress." In the early decades, we also excluded several articles that met our search terms in ways we did not intend (e.g., "eyestrain," "judgmental fatigue"). The remaining 606 articles provide a rich source for textual analyses that we found to be consistent with other sources of information, such as citation rates, historic reviews, and our knowledge of the field.

Number of Publications by Year

Figure 1 provides a visual representation of the annual percent of articles meeting our search criteria relative to the total number of publications during the year. Until the 1970s, approximately 5% of the articles met our criteria, with fluctuations between 0% and 10%. Beginning in the late 1960s and early 1970s, between 5% and 10% of the articles were focused on stress and well-being, and during the past 15 years over 10% of the articles in any given year have addressed stress and well-being. The pattern suggests three broad eras: the 50-year period between 1917 and 1966 (n = 173);
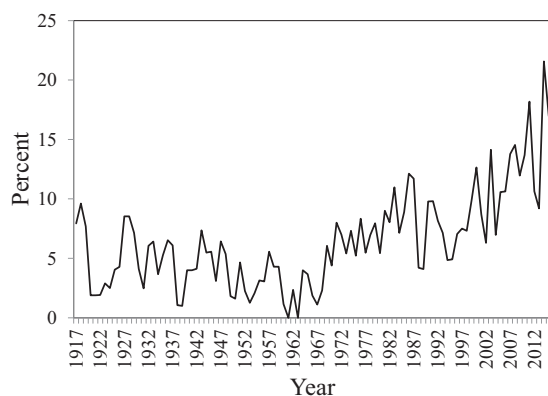
a 30-year period between 1967 and 1996 (n = 213); and the 20-year period for 1997 to present (n = 220).

Setting boundaries for these three eras requires categorizing a continuous process and is therefore somewhat arbitrary. That said, the eras appear to correspond with several noteworthy landmarks in stress research. For instance, the boundary between the first and second eras roughly coincides with the publication of Kahn, Wolfe, Quinn, Snoek, and Rosenthal's (1964) seminal book on role stress, Kornhauser's (1965) book on mental health of the industrial worker, and Lazarus' (1966) book on psychological stress and the coping process. The boundary between the second and third eras marks a widespread increase in research related to job stress and health. For instance, in 1986 the WHO Ottawa Charter for Health Promotion was adopted and set the starting point for a greater emphasis on stress and health issues. The Charter emphasized the importance of health and was followed by a partnership between the American Psychological Association (APA) and the National Institute for Occupational Health and Safety (NIOSH) aimed at promoting the new field of occupational health psychology. In addition, in 1996 the first volume of the *Journal of Occupational Health Psychology* was published, suggesting that the increased interest in job stress research was sufficient to support a new journal.

Figure 2 presents a visual representation of wordclouds for each era. In the wordclouds, a word is presented only if it occurred with at least a frequency of 25% relative to the total number of articles. With this approach, wordclouds for eras are roughly normalized for differences in the total number of articles. In the wordclouds, the most frequently used words are in the center of the cloud, and words further out have lower frequency. Due to the 25% selection criteria, low frequency words do not appear at all.

Figure 2 conveys the degree to which terminology in *JAP* articles has consolidated over the years. The relative absence of words in the first era captures the lack of a unifying theoretical framework and the diversity of research topics. As such, only 10 words appeared 43 times (25% of 173). In contrast, the wordcloud for the second era reveals 24 words that occurred at least 53 times (25% of 213), and for the third era, the wordcloud reflects 49 words occurring in at least 55 times (25% of 220). In the following section, we examine word count frequency of the top 25 words by era (see Table 1) and relate these counts to key historic events and major theoretical developments (online Appendixes B, C, and D provide citations and abstracts for the top 25 most cited articles by era as defined by Google Scholar). We emphasize that we used the words from the abstracts as a foundation of our review, but we augmented the word frequency data with other information, such as citation rates and our knowledge of the field.

The 1917 to 1966 Era

The first era is difficult to characterize from either a theoretical or applied perspective. The word frequency for this era (see Table 1) reveals that the most frequently used term was the word "book," followed by the words "review(s)" and "author(s)." A large number of articles that met our search criteria during the period were reviews of books on "mental hygiene" and similar topics related to stress.

While book reviews dominated the first era, traces of what we currently recognize as research on stress and well-being are also
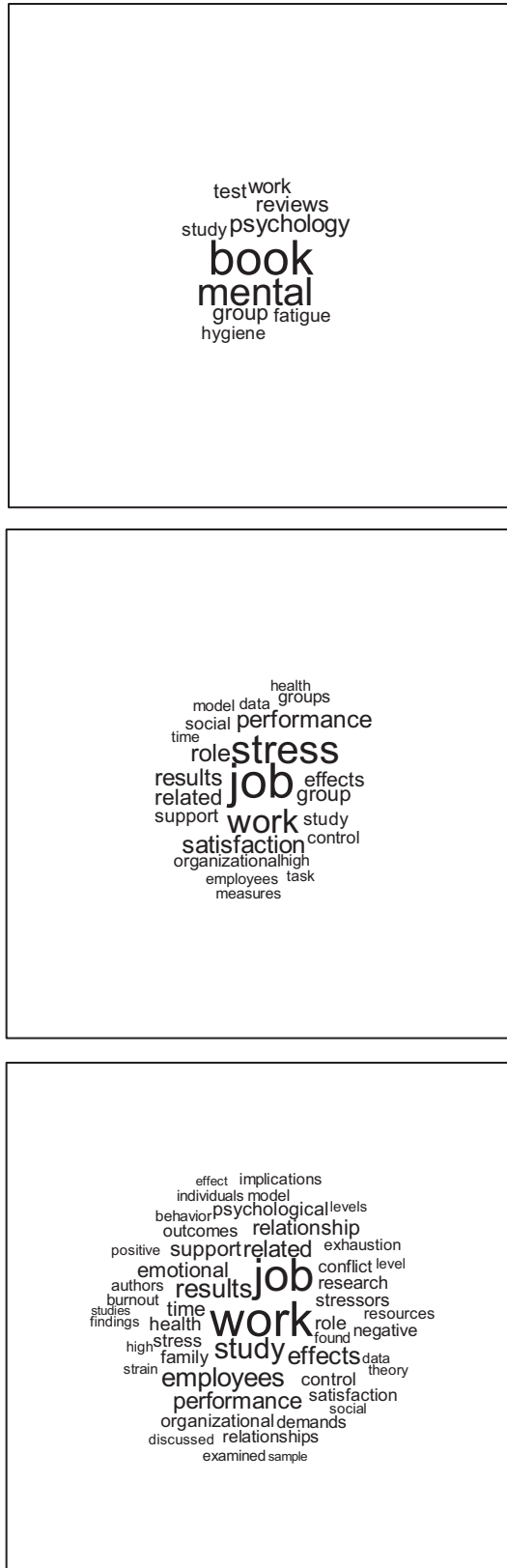

Figure 1. Percent of total articles meeting search criteria.

Figure 2. Wordclouds for three eras.

Table 1

Top 25 Words in Abstracts by Era

1917–1966 Era (*n* = 173)		1967–1996 Era (*n* = 213)		1997–Present (*n* = 220)	
Word	Count	Word	Count	Word	Count
book	169	job	253	work	341
mental	131	stress	205	job	313
group(s)	104	work	165	study(ies)	243
tests(s)	90	group(s)	152	effect(s)	217
psychology	78	effect(s)	126	employee(s)	213
reviews	64	satisfaction	117	relationship(s)	209
group	64	performance	109	results	161
scale(s)	61	role	108	related	141
work	60	results	103	performance	135
problem(s)	58	significant(ly)	96	negative(ly)	130
author(s)	56	related	94	individual(s)	127
fatigue	54	relationship(s)	91	level(s)	126
study	52	analys(es)	85	support	120
child(ren)	51	measure(s)	84	emotional	118
hygiene	48	support	77	behavior(s)	115
personality	41	study	71	theor(etical)	111
part	39	social	67	time	110
social	38	organizational	66	examine(d)	108
performance	38	control	65	positive(ly)	108
students	37	factor(s)	59	psychological	106
psychological	35	data	59	role	104
college	34	model	58	health	102
difference(s)	32	high	58	stress	101
results	31	employees	56	family	100
individual	31	health	53	control	98

evident in the word counts. For instance, a sizable number of articles focused on the development and/or use of scales to assess attributes related to stress and well-being. This trend is evident in words such as "scale(s)," "test(s)," "study," and "personality" as in "personality tests" along with the words "group(s)," "results," and "difference(s)" reflecting analyses of experimental and descriptive studies often focused on scales and tests (e.g., the "Colgate mental hygiene test" or the "Thorndike addition sheets"). In addition, a large number of the studies focused on students and children (i.e., "child[ren]," "students," "college"). Concerns about "mental hygiene" and "mental health" for children and students were common in the early decades of the journal, but later these topics shifted to other specialized journals. In contrast, words related to "problems," "performance," and "work" would remain central to *JAP* and the study of stress.

The Great Depression. As noted, the period between 1929 and 1939 represented the Great Depression. A frequency count during this era and extending 5 years for publication lag (43 publications) is largely indistinguishable from the count for the broader era in that key terms remained centered on book reviews and mental hygiene of children. Interestingly, a detailed search for terms specifically related to the economic conditions such as "unemployment" reveals little to suggest that articles in *JAP* considered these issues relevant, at least from the perspective of stress research.

The wars. An examination of the 64 publications during the war years (and 5-years postwar) reveals that the word "war" appears eight times and words such as "soldier," "officer," and "veteran" do not occur or occur less than two times. The majority of publications related to the war were book reviews ("Shell Shock

and Its Aftermath" following WWI, and "The War and Mental Health in England" following WWII). The first research-based publication appears following WWII in a study of attrition from Officer Candidate School (OCS). In this study, Taubman (1947) described a leadership training system designed to work in part by "provid[ing] an atmosphere freed from the tensions and anxieties of OCS." A second article by Anderson (1949) examined a vocational training program for the placement of veterans and focused on whether those going through the program displayed greater "emotional adjustment." It is interesting that, despite the recognition that the wars presented unique opportunities to study stress (e.g., Hall, 1917), there were relatively few empirical studies that focused on stress associated with the wars.

Mass production. Links between the wide-scale adoption of mass production and work stress are reflected in early writings by Fish (1917) and Martin (1917), and words used during this era reflect the industrial age. For instance, the word "noise" occurred 11 times, and as was the first article we identified as studying a stressor and a strain (Laird, 1933). Moreover, the second most highly cited article (see online Appendix B) during this time period was also focused on the impact of noise (Jerison, 1959).

Other aspects of industrialized work are reflected in the word counts. The word "accident" occurred five times, first in a book review of readings in industrial psychology in 1931 and later in an article by Davids and Mahoney (1957), one of the top 10 most cited stress articles during this era (online Appendix B). Interestingly, the word "shift" occurred only once in our database, suggesting that shift work was not a key concern, and the word "alienation" did not occur at all, suggesting that research in the first era does not foreshadow later issues and concerns with industrialization, such as the large-scale strikes in 1946 (see Appendix A).

Theory. In terms of theory, this era is characterized by the concepts of homeostasis and physiological processes described by Cannon (1932) and Selye (1936). Evidence of the focus on physiological processes is present in Laird (1933) who in studying the effects of loud noise concluded that:

> Most unexpected and of greatest significance, however, was the great increase in the volume of urine excreted at the level of 80 and 90 decibels. This is in harmony, however, with the work of Corbeille on changes in the volume of the kidney and spleen of dogs under different noise influences. This observation is being made the subject of special study and is in line with the hypothesis that the effects of noise are due largely to the appropriate noise causing a biological fear reaction. (p. 329)

In many ways, however, Laird (1933) was the exception rather than the rule in terms of showing links to theory. Words such as "homeostasis" are not mentioned once during this era, and the word "physiological" and its variants occur six times, only in book reviews.

The 1967–1996 Era

The middle columns in Table 1 present the 25 most frequent words in abstracts between 1967 and 1996, a period during which stress research emerged as a central topic in *JAP*. The frequency pattern of words during this period differs dramatically from the previous era, in that "job," "stress," and "work" emerged as the

three most common words. The word frequency pattern also reflects a pronounced shift from book reviews and toward empirical studies reflected by words such as "result(s)," "analys(es)," "data," and "model." In addition, the word frequencies reveal clear patterns with respect to outcome variables. For instance, the words "performance," "satisfaction," and "health" were common. Based on the usage patterns, the 30-year period from 1967 to 1996 represents a critical milestone, introducing new theoretical and empirical paradigms for stress research.

Societal trends: Women in workplace. Perhaps no societal trend is more important than the large increase of women in the workforce between 1960 and 1980. Articles from 1967 to 1996 suggest that this trend is viewed fundamentally differently than when women joined the workforce during the world wars. A clear example of an article examining stress among women is Chacko (1982), who focused on Title VII of the Civil Rights Act and the preferential recruitment and hiring of women, exploring "the relationships between perceived preferential selection and several organizational outcome variables such as organizational commitment, role stress, and satisfaction." Another theme during this era was to examine gender differences in work characteristics, such as job control (Adelmann, 1987) and coping (Parkes, 1990). These articles stand in contrast with studies of women in the previous era. One such study from the previous era examined fatigue among women involved in house care (Gross & Bartley, 1951) and selected participants who were "the mother of at least one child" (p. 205) and "in the habit of doing their own cleaning" (pp. 205–206) in contrast to selecting women who were members of the workforce.

Societal trends: Economic uncertainty. The era from 1967 to 1996 did not have any economic impact that earned the title "great" as in "Great Depression" or "Great Recession." Nonetheless, this period had a number of significant economic shocks, including the Arab Oil Embargo, the Chrysler Bailout, the highest unemployment rate (10.4%) since 1940, and the Savings and Loan Bailout (see Appendix A). Unlike the previous era, there are clear signs that these economic events were reflected in published research. For instance, in our sample of articles, the word "unemployed" occurred 15 times in eight studies. The highly cited study by Caplan, Vinokur, Price, and Van Ryn (1989) is a noteworthy randomized field experiment promoting motivation to seek reemployment (online Appendix C).

Societal trends: Stress and safety. While history has witnessed numerous occupational disasters, the period between 1967 and 1996 was characterized by several particularly noteworthy events. In 1984, the Bhopal gas tragedy is estimated to have killed up to 16,000. In 1979 the U.S. experienced the nuclear accident at Three Mile Island, and in 1986 the Chernobyl disaster released radiation that continues to have negative effects on the surrounding areas. Finally, in 1987 the USS Stark was struck by two missiles fired by an Iraqi jet, and the ensuing damage and loss of life garnered considerable media attention. The tragedies obviously had multiple causes; however, there was broad recognition that high levels of stress were often a factor in a variety of safety accidents. Indeed, even at a national level, links between stress and safety had been drawn earlier in the era in 1970 when the U.S. established the National Institute for Occupational Safety and Health (for a brief history of stress research at NIOSH see Murphy, 2002). Several *JAP* publications during this era reflect the interest

in the role of stress and safety. For instance, one of the top 10 most cited articles from this era is Wright (1974) who focused on time pressure (a stressor) and decision making. Another noteworthy line of research was funded by the Navy partially in response to the USS Stark incident and specifically focused on stress and decision making within teams (e.g., Driskell & Salas, 1991).

Theoretical advances: Role stress. As noted, the 1967 to 1996 era presented significant developments in stress theory. Table 1 shows that terms related to role stress theory (Kahn & Quinn, 1970) were common, with the word "role" occurring 108 times in the abstracts (ranked 8th overall). The first article in our sample that used the word "role" with respect to role stress theory was House and Rizzo (1972). This study used measures of role conflict and role ambiguity as criteria when evaluating a measure of organizational climate. As such, this study deviates from the typical design, in which role stress is cast as a predictor of outcomes such as well-being. The distinction of being the first role stress study to include stressors and strains belongs to Hamner and Tosi (1974), who examined the link between role stress and indices of well-being among 61 high-level managers.

As suggested by Table 1, numerous other studies focused on aspects of role stress theory during this era. Two articles were particularly influential, as indexed by citation rates. The first was Beehr, Walsh, and Taber (1976)'s examination of the moderating effects of higher-order need strength in the relationships among role stressors, individual strains, and organizationally valued states, such as involvement. The second was Caplan and Jones' (1975) study of the moderating effect of Type A personality (online Appendix C).

Theoretical advances: Social support. The era from 1967 to 1996 also focused on identifying moderators of links between stressors, perceived stress, and strains. While a number of individual factors such as personality and coping styles were examined, the word frequency analysis suggests that social support was particularly prevalent (while treated as separate, the words "social" and "support" frequency occurred together). The first study to examine social support as a direct effect and moderator in our database was Caplan, Cobb, and French (1975), which focused on smoking cessation in the workplace (thereby capturing another societal trend).

Three highly cited studies of social support were Ganster, Fusilier, and Mayes (1986), Russell, Altmaier, and Van Velzen (1987), and Etzion (1984). Ganster et al. (1986) is noteworthy because the main finding was the absence of a moderating effect for social support. This null finding reflects a tendency for moderating effects to be more elusive than main effects in social support research (and stress research in general). Both Russell et al. (1987) and Etzion (1984) focused on social support as a predictor and moderator of burnout. While the term "burnout" was not identified as one of the top 25 words in the second era, the word frequency analyses from the next era shows that the origins of burnout research can be traced to the middle era. A final article that deserves mention was the seminal piece by Eisenberger, Huntington, Hutchison, and Sowa (1986) introducing the construct of "positive organizational support" (POS), which has been highly influential and widely examined during this era and the next (see online Appendixes C and D).

Theoretical advances: Moderation. While social support was arguably the key moderator of the second era, studies that addressed other moderators were prevalent. Variants of the word "moderate" occurred in 36 articles, and though this frequency is not sufficient to make the top 25 words in Table 1, it nonetheless demonstrates interest in factors that buffered the relationship between stressors and strains. Moreover, some authors discussed moderating effects without using the term "moderator:" Caplan and Jones (1975), for instance, referred to Type-A behavior as a "conditioner" rather than a moderator of the effects of role stress on strains.

The Era From 1997 to the Present

The word frequencies from 1997 to the present are, in many ways, similar to those of the previous era. Many themes carried over (e.g., role stress, support), and at the same time, new themes emerged, leading to a general increase in the total percent of articles focused on stress and well-being. Given the complexity of the wordcloud for this era (see Figure 2) our coverage of the era would be deficient if we examined only the 25 most frequently occurring words listed in Table 1; therefore, we rely more on words listed in the wordcloud (words that occur with a frequency of 25% of total articles). Functionally, this means we focus beyond the 25 words in Table 1 to the 49 words captured in the wordcloud and in some cases even below the 49 words.

Despite the similarities between the second and third eras, several noteworthy distinctions are evident. First, the word "stress" drops from second most frequent in the second era to the 23rd most frequent word in the current era. The drop may reflect increased specificity in the terminology. That is, instead of generically using the word "stress" to refer to both the causal event and the outcome, researchers appear to have been more careful in delineating between the words "stressor" ($n = 96$) and "strain" ($n = 69$).

Second, "satisfaction" dropped out of the top 25, and the word "emotional" emerged. The expanded list of 49 words includes the terms "exhaustion" ($n = 84$), and "burnout" ($n = 78$). These patterns suggest an overall change and expansion in the nature of strains.[2] Third, for the first time, the word "family" ranked in the top 25, and the word "conflict" occurred in the expanded set (86 times). We discuss the emergence of "family" in terms of broader societal trends, but the terms clearly indicate increased interest in conflict between work and family.

Societal trends: Work boundaries. Although current trends can be difficult to decipher, we anticipate that technological changes blurring the lines between work and nonwork will be seen as a defining characteristic of the early 2000s. This theme is manifested in numerous ways. For instance, while the first two articles examining work–family conflict were published in 1994 and 1995, the topic greatly expanded in the last era. In a similar vein, the concept of "recovery" occasionally appeared in the journal, with the first instance in an examination of acute recovery related to sleep deprivation among pilots (Dowd, 1974) and then three times more in the 1990s. However, in the 2000s, interest in this topic increased, with 10 studies examining detaching from work during nonwork periods (vacations, weekends, free evenings, etc.). Stress associated with the blurring of work and nonwork boundaries is also captured by the emergence of the word "detach-

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[2] Note that the word "emotional" reflects strain as in "emotional exhaustion" and stressor as in "emotional labor."

ment," which occurred 30 times during this era (e.g., Etzion, Eden, & Lapidot, 1998). Finally with respect to work boundaries, four of the top 25 most cited articles in this era (online Appendix D) centered on work-family conflict (e.g., Ford, Heinen, & Langkamer, 2007; Frone, 2000; Judge & Colquitt, 2004; Major, Klein, & Ehrhart, 2002). Clearly the study of work stress in the current era has expanded beyond the workplace into broader aspects of life.

Societal trends: Work tensions. Although the words "harassment," "aggression," and "incivility" did not appear in Table 1 nor in the expanded list, these topics are important when indexed by article citations (online Appendix D). For instance, the 10th most cited article is an examination of the antecedents and consequences of sexual harassment by Fitzgerald, Drasgow, Hulin, Gelfand, and Magley (1997), and the attention garnered by this study likely reflects broad societal issues surrounding workforce diversity along with the recognition that conflict in work settings has important implications for employee well-being.

Societal trends: Burnout. One can debate whether use of the words "burnout" and "emotional exhaustion" reflect something about the broader societal milieu or about advances in theory surrounding work stress. Nevertheless, one cannot deny the importance of the burnout construct within the last era. In addition to the increased prevalence of the words "burnout" and "exhaustion" mentioned earlier, six of the top 25 most cited articles in this era and four of the most cited articles in the previous era focus on some aspect of burnout (see online Appendixes C and D). From the current vantage point, it appears that burnout and its variants have become prominent strains in the study of stress and well-being.

Theoretical advances: Resources. As noted, many of the theoretical ideas proposed and tested in the previous era continue to be refined during the last era. Role stress theory, in particular, continued to be influential as indicated by the word "role" in Table 1. The last era also appears to be one in which COR theory (Hobfoll, 1989) was frequently used as a theoretical framework. COR theory was first referenced by Lee and Ashforth (1996) during the previous era in a widely cited meta-analysis of predictors of burnout (online Appendix C), but the word "resources" occurs 82 times in the current era. The importance of resources in stress and well-being research is also reflected by the most highly cited article in this era (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001).

Theoretical advances: Multilevel models. While advances in statistical methods do not formally constitute theory development, methods do play a key role in researchers' ability to test theory. The 1990s brought important methodological advances for analyzing hierarchically nested and longitudinal data (e.g., Bryk & Raudenbush, 1992), and methods referred to as "multilevel" or "mixed-effects" models were widely adopted. Consistent with these developments, the words "level(s)," and "time" emerged in Table 1, reflecting the increased reliance on multilevel and longitudinal approaches. Several of the highly cited articles during the last era (e.g., Jex & Bliese, 1999) relied on these approaches for modeling shared group-level constructs such as collective efficacy (online Appendix D). In addition, the within-person variant of these analytic approaches became standard for examining phenomena such as recovery processes in experience sampling designs (Sonnentag, Binnewies, & Mojza, 2008).

Summary and Status of Theory

Research on stress and well-being has been present since the inception of *JAP*. Over time, however, this line of research has increased and currently approaches 20% of journal space (see Figure 1). We see several reasons for this increase. First, *JAP* research has become increasingly reflective of broader societal events. Second, researchers have operationalized many stress-related theoretical concepts and applied them to work contexts. Third, new measures and statistical approaches have proven useful in the study of stress and well-being.

Reflecting Societal Trends

Overall, publications in *JAP* reflect larger societal trends, and it appears the journal has become increasingly synchronized with current events (see online Appendix E for a summary and additional references linking research to key events). Interestingly, however, we found it difficult to predict which events would be reflected in the journal. For instance, we expected that links between "war" and "stress" would have been quite pronounced given Hall's, 1917 editorial and a series of major conflicts over 100 years including two world wars, the Korean War, the Vietnam War, and wars in Iraq and Afghanistan. Unexpectedly, though, the term "war" occurred infrequently throughout the time frame of our review. In recent years, the distinctions between clinical and applied psychology are more strongly defined than in the early years of the journal; therefore, one might expect a lack of war-related research in more recent years as outcomes of war stress are seen as clinical problems. In the early years, though, where clinical and applied boundaries were less clearly delineated, it seems surprising that the topic was rarely addressed.

While the topic of war stress did not gain much attention in *JAP*, other societal events certainly attracted interest and links to these events strengthened over time. For example, we found little evidence during the Great Depression (1929–1939) that concurrent societal trends such as unemployment were of interest to *JAP* authors. In contrast, during 30-year era from 1967 to 1996, there were clear links to trends such as high unemployment and women entering the workforce. During the past 50 years, it is also apparent that technological changes in the workplace are reflected in *JAP*.

One reason why *JAP* might reflect some societal trends more than others is that stress researchers have increasingly focused on white-collar and service-related employees rather than blue-collar employees. The early writings of Fish (1917) and Martin (1917) addressed blue-collar workers, and research on topics such as the effects of noise (Jerison, 1959; Laird, 1933) took place in industrial settings. Stress research during the past 50 years, however, has tended to emphasize issues relevant to white-collar, professional workers and to employees in service-related jobs. One way to characterize the shift is to examine words that reflect outcomes over the three eras: The only clear outcome to register at a rate of 25% of the total publications in the first era was "fatigue"—a term that often applied to manual labor. In contrast, in the second era two clear outcomes occurred with high frequency: "performance" and "satisfaction." These words could apply to manual, industrial type jobs but they are also applicable in white-collar and professional jobs. In the third era, however, six clear outcomes are identifiable ("burnout," "exhaustion," "health," "performance," "satisfaction," and "strain"). By the third era, the list of outcomes

has broadened and increasingly appears to reflect increases in terms related to professional and service-related occupations.

There are likely two explanations for the field's emphasis on professional and service-related occupations. First, in many Western societies the number of white-collar and service jobs has increased relative to blue-collar jobs. Second, many key theoretical constructs of interest such as role stress and emotional burnout are seen as particularly relevant to white-collar and service-related populations. One consequence is that when events such as job layoffs from economic shocks occur in professional and service-related populations, researchers are likely to capture these events and thus JAP ends up reflecting larger societal trends.

A final observation concerns the degree to which publications in *JAP* reflect global issues. For the most part, *JAP* articles have centered on phenomena observed in North American and, to a lesser extent, certain European and Asian societies. Although the prevalence of stress research using samples from outside North America has increased, it remains relatively rare in *JAP*. From a more global perspective, studies focusing on job stress in Latin America, Africa, and Arab countries as well as on processes related to global migration still need to find their way into *JAP*.

Theory

A second reason why work stress research may have become increasingly prevalent in *JAP* is that many of the key theoretical constructs and models proposed in the broader domain of stress research can be readily applied to the work context. From our review of *JAP* trends, it is clear that influential theories from outside of the work domain influenced the study of work stress. These influences are apparent in seminal theories of work stress developed in the 1960s and 1970s, most notably role stress theory (Kahn et al., 1964), and had a dramatic impact on subsequent research published in *JAP*. It appears that the most influential theories are those whose key elements: (a) are work specific, such as role ambiguity and role conflict; (b) can be readily measured, as exemplified by the widely used measures of role stress developed by Rizzo, House, and Lirtzman (1970); and (c) are relevant to white-collar and service-related populations.

Perhaps one reason why research on stress and well-being appears fractured during the first 50 years of the journal is that, during that time, stress theories focused largely on physiological processes. Such theories were difficult to operationalize in the work context and so, to a certain extent, they had little influence on stress research at work. Interestingly, many of the methodological tools used by researchers in the second era, such as surveys and correlational analyses, were available during the first era, so theory rather than method appears to be the most parsimonious explanation of the relative dearth of early stress research.

Advances in Research Methods

A third factor that might explain the increase in stress research involves methodological advances. Early research in *JAP* was foundational by focusing on issues such as the measurement of key constructs such as fatigue. Therefore, when new theoretical models were proposed, researchers had already developed a measurement foundation upon which to operationalize constructs to test theoretical propositions.

In a similar way, techniques such as mixed-effects models (Bryk & Raudenbush, 1992) used in educational settings to study students in classrooms, were easily generalized to research on stress and well-being in occupational settings to model shared group properties. Similarly, variants of mixed-effects models that apply to individual processes over time and allow for longitudinal analyses have also been valuable in examining stress processes (Zapf, Dormann, & Frese, 1996). Other noteworthy statistical developments include the use of polynomial regression in research on the person-environment fit approach to stress (e.g., Edwards & Harrison, 1993) and advances in tests of mediation to examine basic processes underlying models of stress (Edwards & Lambert, 2007; MacKinnon, 2008).

Conclusion and Future Trends

The fundamental idea expressed by Fish (1917) that the "shop shall be comfortable in both a physical and a mental way" (p. 162) is probably more germane to the core of *JAP* in 2017 than it was in 1917. Over the last 100 years, concepts of what constitutes the "shop" have changed in ways that few people could have foreseen. Likewise, concepts of what it means to be "comfortable in both a physical and mental way" have changed reflecting increasing interest in the psychological impact of nonphysical work stressors linked to strains such as burnout and emotional exhaustion. It is important to note, however, that while the traces of stress research were present in 1917, it took advances in theory to serve as the spark that ignited the research topic area. By themselves, societal events (even momentous events like world wars) failed to drive research; rather, the catalyst was provided by theorists who presented interesting, relevant, and testable propositions. Looking ahead, we anticipate three trends that are particularly likely to stimulate the development, testing, and refinement of stress theory: (a) integration of physiological data; (b) ability to test work-life cycle models; and (c) stress management trials.

Integration of Physical and Physiological Data

Interestingly, in a potential return to elements of the past, technological advances in sensors continue to make the collection of physical and physiological data streams increasingly feasible in applied settings. We believe that streams of data from sensors are likely to capture even broader ranges of stressors (e.g., physical exertion, noise, ambient temperature) and strains (e.g., sleep quantity and quality, body temperature, endocrine markers) that will further allow the field to refine knowledge of the stress process (e.g., Dettenborn, Tietze, Bruckner, & Kirschbaum, 2010). At the same time, as sensor-related data progresses, the field is almost certain to require significant theoretical advances to integrate the information into testable, relevant hypotheses.

Work–Life Cycle Models

Second, we foresee the development and maintenance of work-life cycle longitudinal databases focusing on work stressors, moderators, mediators, and strains. Work–life cycle data will allow

researchers to test and refine process-related theories about stress, coping, and well-being over extended periods of time (see also, Cummings & Cooper, 1979; Edwards, 1992) and potentially link these processes to medically recognized diseases. That is, despite the expansion of strain-related variables over the last 100 years, few studies link work stressors to hard medical outcomes over time.[3] Many stress theories posit a cyclical relationship between stressors, coping, and well-being, so we see opportunities to test and refine theory by examining long-term, dynamic relationships that contain a variety of predictors and moderators along with an expanded set of medically diagnosed outcomes.

Stress-Management Trials

Finally, when we examine word usage during the past 50 years, words such as "relationship(s)," "related," and "effect(s)" frequently emerged in the abstracts (see Table 1). The frequent use of these words reflects a general avoidance of causal language, as in "the relationship between the stressor and the strain was significant." Fundamentally, however, theories of stress are causal and, as such, should be tested with research designs that allow stronger causal inferences.

To some degree, one can argue that the roots of stress research lie in studies that allow for stronger causal inference. Recall that the first *JAP* article we identified that included both a stressor and strain was Laird (1933) in an experiment study of loud noise. During the past 50 years, however, designs have been primarily quasi-experimental or correlational. That is, studies have measured constructs and described relationships among stressors, moderators, and strains either at single points or, in limited instances, in longitudinal designs.

Obviously, ethical issues can preclude randomly assigning individuals to different conditions involving stressors. In contrast, few if any unsurmountable ethical issues preclude conducting randomized trials focused on interventions designed to help employees cope with work stressors (i.e., stress management strategies). Unfortunately, however, well-designed randomized trials that would allow one to make causal inferences about stress management strategies remain rare. For instance, in 2008, Richardson and Rothstein (2008) published a meta-analysis on stress management intervention programs in which they identified only 38 articles between 1977 and early 2006 (approximately 1.3 a year). Of the 38, three were published in *JAP* (Bruning & Frew, 1987; Ganster, Mayes, Sime, & Tharp, 1982; Jackson, 1983).

One consequence of having few studies focused on stress management interventions is that we, as a field, are then limited in our ability to develop and refine theory surrounding implementation science—an area of research becoming increasingly important in public health (e.g., Bammer, 2005). Thus, in concluding our 100-year review of research on stress and well-being, we anticipate that theory and research will continue to evolve in ways that support stronger causal inference, and more specifically that the field will continue to develop theory and research that support actionable knowledge to help organizations manage the diverse and unpredictable stressors that will emerge over the next 100 years.

[3] An anonymous reviewer made this astute observation and we completely agree.

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