A STUDY ON INTERDISCIPLINARY WORKS OF MIND AND COMPUTER

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Introduction

What is scientific psychology?

Everyone is aware of psychology which is a study of mental behavior and only a few populations appreciate about the scope of modern psychological treatments and the psychologists' method of treatment. A good public awareness of the roles of psychologists in clinical and mental health settings, also in schools and the workplace, but much less knowledge of psychologists as laboratory scientists. This paper aims to give a brief account of psychology as an academic discipline, to differentiate science and practice in psychology, and to illustrate how fundamental and applied problems are interdependent. Finally, the document deals with the needs of psychology as a scientific discipline.

What is psychology?

Psychology is the study of mind, brain, and behaviour. As an academic subject originating in mental philosophy, it gradually evolved into an independent discipline in the late 19th century as it became clear that the mind and its products could be studied and measured experimentally. As examples, early researchers set up experiments to study the factors affecting reaction time and those determining the loss of information from memory. The study of mental experience was gradually replaced by an emphasis on human and animal behaviour in the early 20th century. "Mentalism" was rejected as being unscientific, and the behaviourist school focused on measuring changes in stimuli and corresponding changes in responses. In time this approach was also seen to be quite limited, as it ignored both the experiential aspects of mind (feelings, attitudes, emotions, aspirations) and the physiological correlates of mental experiences and behaviours.

Development of psychology

The development of information technology by electrical engineers and communication theorists in the 1950s provided psychology with a new metaphor (mind as a communication channel) and also a new system of measurement (the flow of information through the organism). The study of cognition--perception, attention, memory, learning, language, thinking, and reasoning-evolved naturally from these ideas, and experimental research on these topics has grown exponentially over the last 40 years. At the same time, research on animals has shifted from laboratory-based studies of learning mechanisms to a broader "ethological" consideration of animals in their natural environments, including studies of their foraging, mating, navigation, and social interactions. Other major branches of contemporary psychology-developmental, social, personality, and clinical--have evolved along similar lines.

Two further developments in the last 30 years have led to important advances in the field. The first is an increasingly sophisticated use of measurement and experimental control of behaviour, thus bringing psychology closer to being a lawful science. The second is the recent rapid progress in the brain sciences. Traditionally, "physiological psychology" explored the neural bases of sensation, perception, learning, motivation, and emotion in humans and animals. Today, new technologies in genetics, immunology, neuro-pharmacology, and neuro-imaging.

In sum, present-day academic psychology is focused on understanding the individual's feelings, motives, thoughts, and actions. This understanding incorporates findings from studies of human and animal development, the neurosciences and ethnology, and the study of abnormal behaviour in clinical and social settings. Psychology's focus on the single individual is enlarged and enriched by also studying individuals in groups, an important area in social psychology. Recently, cognitive psychologists interested in modelling various aspects of behaviour mathematically or by computer models have joined forces with linguists, philosophers, and computer scientists to form the new sub discipline of Cognitive Science. In a parallel development, human experimental psychologists collaborate increasingly with neurologists and neuroanatomists under the banner of Behavioural Neuroscience.

Academic psychology departments and research institutes serve as training grounds for professional psychologists working in clinical and educational settings; they also function as home bases for carrying out the research underpinning such professional applications. Indeed, many psychologists working in professional fields see and classify themselves as `scientist-practioners,' emphasizing the close relations between the basic discipline and its areas of application.

Trending Research in Psychology

Psychology is extremely broad, merging into sociology and anthropology at one end of its spectrum and into neuro-pharmacology and neuro-anatomy at the other. Methods to study attitudes toward immigrants or moral development in children necessarily differ from those used to explore neuronal regeneration after stroke or areas of the brain involved in memory processes. Indeed, some universities have even organized “psychology as a life science” and “psychology as a social science” into separate departments. Such a separation is counterproductive in our view; individual differences in genetic inheritance and brain structure are obviously important for cognitive, developmental, and personality psychologists. Likewise the aspects of brain development concerned with language and with pattern perception depend heavily on cognitive and social interactions during the child's early years. Psychology as a discipline thus unifies the study of the individual, and serves to counter the tendency of researchers to focus on their own specific problem to the exclusion of its contextual surroundings or related problems.

The samples of “fundamental science” projects, although actual and potential applications are indicated below:

* **Neuroimaging of memory:** The recent development of functional neuroimaging methods, such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), allows neuroscientists to study brain activities “online.” The functions of the brain include such psychological constructs as attention, perception, memory, and language, and Canadian psychologists have been major players researching their neural correlates. An excellent example is Endel Tulving's discovery of different sites in the brain controlling memory encoding and retrieval, respectively.

* **The study of pain:** Canadian psychologists are among the world's foremost researchers of chronic and acute pain. Ronald Melzack was a co-author of the gate control theory of sensory-dependent pain, and his recent work includes an even broader theory of chronic pain-the neuro-matrix theory-which links stress and pain and proposes that pain is produced by the body-self neuro-matrix in the brain. A complete theory of pain will necessarily involve personality and environmental factors, as well as factors tied to physiology and pathology.

* Neuropsychology of memory, attention and language: The influence of the late Donald Hebb still pervades Canadian psychology. The pioneering work of Hebb and his student Brenda Milner at McGill and the Montreal Neurological Institute led to theories of amnesia and attentional neglect. Single case studies, such as the celebrated HM investigated by Milner and others, laid the groundwork for understanding how the brain encodes, stores, and retrieves personal memories.

* **Brain plasticity:** Another of Hebb's major influences stemmed from his realisation that perceptual-motor experience can influence brain structure. His initial work showed that rats reared in enriched environments had superior perceptual-motor abilities in adulthood. This research, still carried on by Bryan Kolb at Lethbridge and others worldwide, has clear implications for understanding neural regeneration after traumatic brain injury.

* **Bilingualism:** Research on bilingualism is particularly appropriate in Canada, and Wallace Lambert -- another McGill-based pioneer -- studied this topic for some decades. His research revealed the cognitive, educational, and social advantages to being or becoming bilingual and his advocated `immersion education' method has now become a system for second-language learning used widely throughout Canada, the U.S., and Europe.

* **Studies of animal learning:** Research on animal learning is of interest in its own right and also for clues to human learning. Bennett Galef has shown that rats learn from others in their colony to prefer certain foods and avoid poisoned bait, and Sara Shettleworth has investigated memory for cached food in birds. Some species of birds can hide hundreds of seeds and recover them months later--an interesting example of a highly evolved adaptive ability. "Bird brains" are demonstrably superior to human brains, in some respects at least!

* **Language and literacy**: Researchers have contributed important insights into the body of evidence that shows the effects of social context and parental involvement in language development on the acquisition of literacy and the course of literacy in the early years. We know that talking to children, reading stories to them, and playing word games contribute to children's mastery of the literate form and their facility in using it. The unique contribution of researchers has been to study this development in children who speak different languages (English or French) or who are raised in bilingual families.

* **Psychopathy:** Psychopaths commit a disproportionate share of crime in society and have high rates of re-offending, so it is important both to detect this syndrome and understand the factors producing it. Robert Hare at UBC is researching this question; his Psychopathy Check List, developed over the years, is arguably the best psychological instrument for diagnosing and assessing this condition.

* **Studies of the family:** Psychologists have contributed greatly to understanding the pressures on family structure and bringing up children. Classic research on children's social learning in children was first undertaken at the University of Waterloo.
Special focus has been placed on the form of parent-child interaction within 1- and 2-parent families, sexual identification of boys reared in fatherless homes, and child-rearing problems associated with maternal employment, day-care, and early childhood education.

* **"Critical Thinking" and educational policy:** Education is more than transmitting knowledge; it is instilling in the individual the ability to analyze information, to evaluate arguments, and to make decisions. In educational jargon, these skills have come to be part of the goal called "critical thinking." Research in critical thinking has implications for educational policy in terms of decisions to develop standardized testing, focus curricula on basic skills, and restrict the range of optional subjects available. Because of the enormous impact of such decisions, they need to be informed by research that assesses long term outcomes from various educational alternatives, monitors progress as children acquire these skills, and evaluates the effects on children's intellectual development. Canadian psychologists have made important contributions to this area, although much work remains to be done.

Discussion

The overall aim of the present investigation was to provide empirical evidence for a relationship that presents a popular press–science paradox. The association of WFC with women is ubiquitous in the media and in the

minds of many people. However, work–family researchers have struggled to find clear support for this association, both theoretically and empirically. We bring clarity to the literature by demonstrating via our meta-analytic synthesis that there is little evidence for substantial gender differences in WFC. Although the association between gender and WIF and FIW was statistically significant in the direction of women experiencing more conflict overall, the correlations were very small in magnitude and may be considered negligible for practical purposes. Interestingly, results differed somewhat by type of conflict; for example, men actually reported more time-based WIF than women, though the effect was still small. Some researchers have suggested that lack of gender differences may be due to qualitatively different work and family roles that men and women typically hold. To empirically address this idea, we examined gender differences in WFC in samples consisting of only parents, full-time workers, people in the same job, and dualearner couple dyads. Although significant differences were found in four relationships (i.e., mothers reported greater FIW than fathers, women in dual-earner couples reported greater FIW, men in dual-earner couples reported greater WIF, and women in the same job as men reported more WIF), the latter two relationships were quite small. The former two relationships were the largest gender effects observed across our meta-analyses (albeit they are still rather small) and thus we elaborate more on those below.

Theoretical Findings and Implications

A main focus of our investigation was to test the veracity of various, often inconsistent, theories that have been proposed by work–family researchers. In examining the results of our investigation superficially, one could argue that the lack of observed gender differences in WFC implies that there is simply no meaningful relationship present and the need for theory is then removed (i.e., why aim to predict a relationship that is very small or does not exist?). We caution against this interpretation. In fact, we would argue that the proliferation of theory in this domain highlights the many complexities and intricacies involved that necessitate careful study.

We speculate that one relevant mechanism missing in extant theorizing is the role of genderspecific expectations and socialization. Men have traditionally fulfilled their family role by providing financially. By working outside of the home, a man can fulfill both his work role and traditional family role—work and family demands are mutually supportive in this sense. On the other hand, the traditional mother or spouse role for women involves tending to family matters. When a woman works outside of the home, it takes away from her time available to fulfill her family caretaking role, meaning the roles are not mutually supportive in the way they are for men (Barnett & Baruch, 1987; Hodges & Park, 2013; Simon, 1995). Applying this to WFC, occupying dual roles may create internal conflict, guilt, and feelings of inadequacy for women (and not men), which increases stress, depletion, and perceptions that roles are in conflict, particularly when work interferes with family. Indeed, some research supports the idea that women experience greater guilt related to the work role impinging on family (Aycan & Eskin, 2005; Borelli, Nelson, River, Birken, & Moss-Racusin, 2017), although other studies find no gender differences (Offer & Schneider, 2011; Hochwarter, Perrewé, Meurs, & Kacmar, 2007). Given the limited research to date on the relationships between gender, guilt, and WFC, we were unable to test guilt as a mediator, but encourage future work to examine this possibility.

Future Research

In addition to the ideas mentioned previously, we advocate that future researchers adopt novel methodologies to investigate gender differences in WFC and examine whether results based on these alternative methods converge with the results of our meta-analysis, which is based mostly on cross-sectional, retrospective survey data. One method is to examine WFC on a within-person, episodic basis rather than via the traditional between-persons, levels-based measures (Maertz & Boyar, 2011).

The levels-based approach involves asking participants to judge the extent that they agree or estimate general frequency of items that represent WFC experiences over a nondescript time period. This is in contrast to

the episodic approach, which asks participants to report discrete experiences of WFC when or shortly after they occur. Measures used in previous research of this nature (Shockley & Allen, 2013; Shockley & Allen, 2015) are also broader and open-ended (e.g., "Did you experience WFC today? If yes, please describe the WFC situation."). Using an episodic daily diary methodology, researchers could address numerous novel questions, such as (a) how many discrete episodes of WFC do men and women report across some set time period? (b) is the content of what men and women view as WFC similar? (c) how do these discrete episodes translate into reports of levels-based WFC (measured on a daily basis or chronically) and does this differ by WIF or FIW? If gender differences do emerge in this more microlevel of analysis, it implies that the lack of gender differences observed in levels-based research may be attributable to factors such as recall bias or differential interpretation of similar events. On the other hand, finding no gender differences would allow us to place greater faith in findings based on the traditional, levels-based research.

Limitations

Despite its contributions, the present investigation has certain limitations. We underwent extensive efforts to include all relevant published studies, but given the large scope of the project we did not include unpublished studies (except for select conference presentations, theses, and dissertations) in our meta-analyses. This could result in publication bias, though recent research suggests that the file drawer problem appears to be uncommon in the organizational sciences literature (Dalton, Aguinis, Dalton, Bosco, & Pierce, 2012), which we drew heavily upon in these studies. Moreover, the large N and the fact that gender was not a main focus of many of the studies and thus not as prone to "significance bias" also alleviates this concern to a large extent. Many of our hypothesis tests were based on meta-analytic correlation matrices.We urge researchers to interpret our results with this in mind. We also recognize that issues can arise when correlations within a meta-analytic matrix are based on samples that may come from different populations, but this was the only feasible approach to generate the meta-analytic correlation matrix necessary for path modeling when studies in the literature do not include all variables of interest.

Conclusion

The discipline of psychology, in all of its various manifestations, is thriving throughout all over the world. When assessed recently against other scientific fields funded by NSERC, using rigorous objective criteria and a panel of distinguished international scientists, psychology was judged to be first in international stature.

The challenge for psychologists, in partnership with our fellow scientists throughout this country, is to communicate more effectively with both members of the public and politicians alike, so that we can convince them that funding scientific research is an investment and not simply an irretrievable expenditure. The time for passive reflection and self-congratulation is over. As psychologists we are well aware of the excellence and innovation that characterize our discipline, but now is the time to take a more active stand and to publicize our achievements and potential to affect real change for the benefit for all.

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